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Concrete

Devoted to the Manufacture,
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NOVEMBER, 1935

400 West Madison Street
Chicago, Illinois

Private Construction Is Climbing

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PRIVATE building construction has continued to increase throughout the present year, at a constantly accelerated rate.

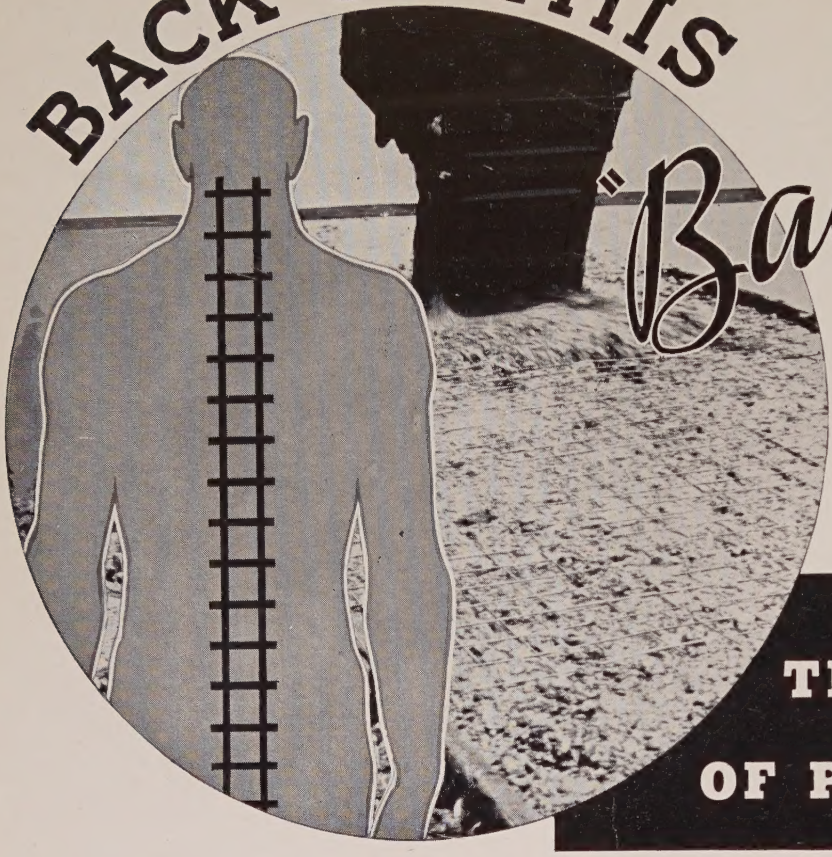
◖ Residential building construction is the most important single factor in this improvement—a fact that is particularly significant because along the hard road leading out of every previous depression, home building has been the leader of the construction group.

◖ As shown in a chart appearing in this issue, the F. W. Dodge organization reports that residential building contracts in September were two and one-half times the figures for the same month last year.

◖ For the first nine months of this year, residential contracts were nearly twice as much as in the same period of 1934. All other private building contracts are also climbing rapidly.

◖ The apparently poor showing for all construction in 1935 is due entirely to the drop in public works construction as compared with last year. Private construction—the kind that really counts in the end—has definitely turned upward.

BACK OF THIS "Backbone" OF CONCRETE



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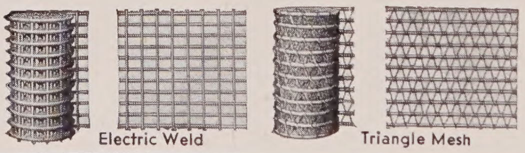

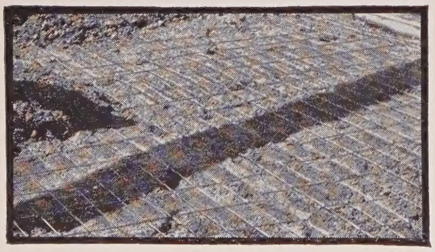

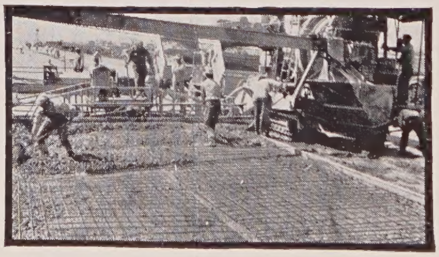

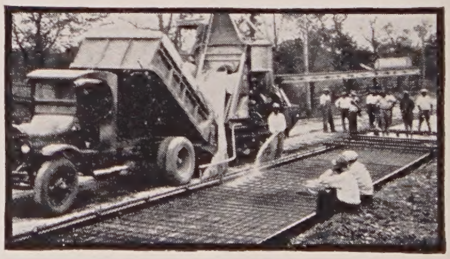

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Concrete

Vol. XLIII, No. 11

NOVEMBER - - 1935

Side-Hill Concrete Mixing Plant Reduces Construction Cost

Cement and Aggregates Delivered Direct from Upper Level at Milwaukee Filtration Project—Rehandling Cost Avoided—Pipe Line Distributing System Pumps Concrete 1,500 Ft.

ADAPTABILITY of cement and aggregate storage bins and batchers to suit the job and the landscape has resulted in a substantial saving in construction of a water filtration plant for the Milwaukee Water Works, Milwaukee, Wis., one of several huge PWA projects built in that city.

Equipment which had been used on another construction job was brought into use under radically different working conditions, with plans so laid that all bin and batcher equipment could be used on the water purification plant project.

Extent of Project

The job, which is expected to be finished early in 1936, calls for water reservoirs and coagulation basins, and involves construction of 32 filter beds and a clear well. The filter beds are 10 ft. deep, 46 ft. wide and 57 ft. long, capable of filtering 200,000,000 gallons of water a day. The clear well, which underlies the filter beds and into which the purified water is to run, is to be 18 ft. deep and 300 by 400 ft. in plan. It will have a capacity of 13,000,000 gallons.

The entire plant is being built on land wrested from Lake Michigan by means of a coffer dam. The location is at the base of a sharp lake bluff, several miles from a railroad, and could be reached only by trucks traveling through a residential section of the city. Because of that, special adaptations of machinery for handling bulk cement and aggregates had to be made.

Central Mixing Plant

More than 35,000 cu. yd. of concrete will be placed before the plant is completed. To handle this mass, the central mixing plant is operated at the maximum rate for the size of the mixers. The bins of the proportioning plant have a storage capacity of only 200 cu. yd., and from 48 to 50 cu. yd. of concrete were placed every hour during August and September. Work was carried on from 12 to 18 hours a day to have the project well finished before snow flies.

The Kramp Construction Company, Milwaukee contractors, had used the bins and batchers here employed, in construction of the Jones Island sewage disposal plant at Milwaukee.[1] A bucket elevator set-up was necessary on the earlier project, with cranes unloading aggregates direct from railroad cars into the mixing and storage bins.

A Side-Hill Location

On the water purification project it was possible to do away with crane-lifting operations. The location of the plant at the base of the steep lake bluff enabled construction of a ramp from the top of the bluff directly to the bins of the central mixing plant. Trucks backed onto a horizontal ramp and un-

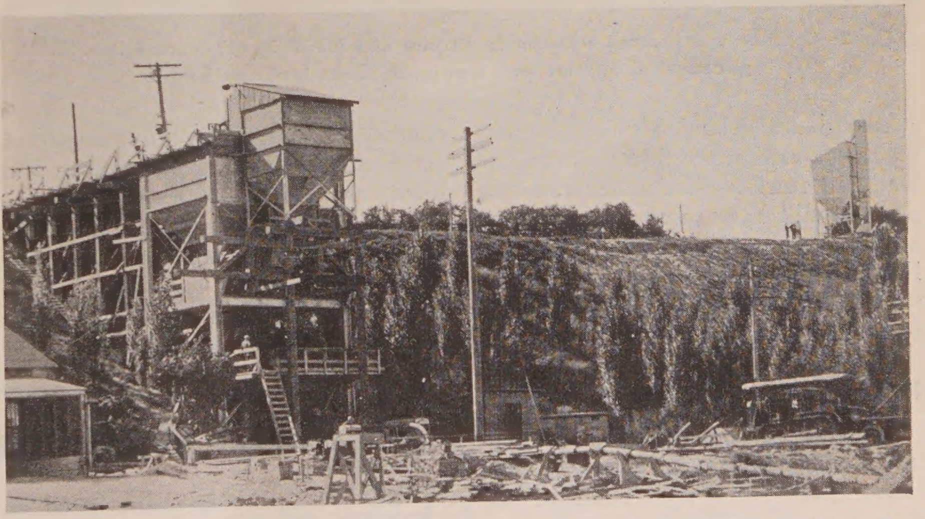

Fig. 1—Side-hill location of concrete mixing plant permitted trucks to deliver cement and aggregates from upper level, in construction of Milwaukee filtration plant

loaded by gravity directly into hoppers.

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[1] Described in the June (1934) issue of CONCRETE, pages 3 to 5.

Crane operating costs of from $65 to $75 a day were eliminated by the side-hill construction. The ramp construction cost was a fixed cost, not a daily cost. Because all material had to be hauled to the site by motor truck, there was a decided saving in locating the plant under the hill, as unloading operations did not require an extra handling of materials. There was no handling of either aggregates or cement at the site. The crane which had been used at the Jones Island sewage disposal plant was used at the railroad tracks to load the trucks. A double crane expense would have resulted if the side-hill arrangement had not been possible. Few locations in Wisconsin or the Midwest would have been so ideal for such an arrangement.

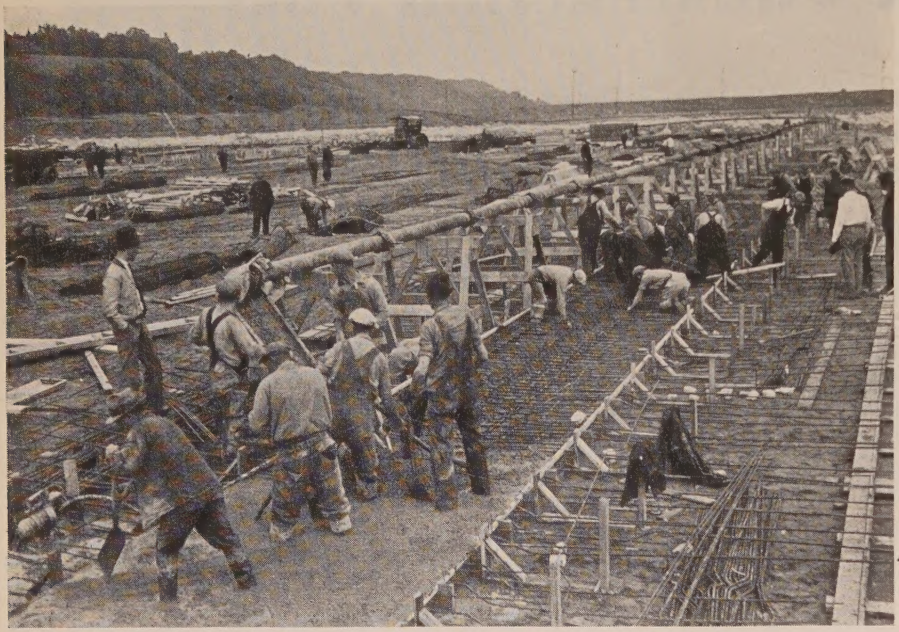


Fig. 2—Concrete was pumped a maximum distance of 1,500 ft. in a 7-in. pipe line. Final placement of concrete with a swinging chute is shown here

Pump Concrete Through Pipe Line

Concrete was pumped from the central mixing plant to the forms by pipe line. There was a dead pump of 300 ft. to the nearest spot that concrete was placed, and in some locations the pumpage was 1,500 ft. Seven-inch pipe line was used, employing the method of construction developed at Boulder Dam, Wilson Dam, Fort Peck Dam and other construction projects. The pump had a capacity of 24 to 50 cu. yd. per hour. Following completion of each day's work a "go-devil" was placed in the pipe line and a high pressure water pump turned on. This forced the mix from the pipes and left them ready for the next day's work.

Although the mixing plant was operated at capacity, the size of the storage bins was ample for the required output per hour. At Jones Island the same bins and mixing plant had been able to put out 50 cu. yd. per hour, with a bin size of 65 cu. yd. The cranes were able to load materials into the hoppers as fast as needed. At the water purification plant the same storage bins were used, although the cranes were eliminated by the side-hill dump-truck arrangement. The trucks kept the bins filled as needed, with an efficiency greater than that of the crane. If the trucks hauled too fast, stock was piled on the ground at the top of the hill. A bucket loader picked up the materials from the stock piles as needed.

Delivering Bulk Cement

At the start of concreting operations, bulk cement was brought by trucks, in 30 bbl. loads, from the Milwaukee storage terminal of a cement manufacturing company. The haul was through an exclusive residential district and along a speedway on the Lake Michigan shore. With concrete placing operations rushed day and night, the trucks were hauling continuously. Residents complained of the noise of trucks at night, and the Milwaukee city council required contractors to erect a storage bin to hold sufficient materials to enable operation at night without the necessity of hauling by truck.

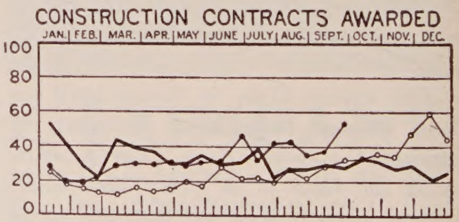
A 450-bbl. bulk cement storage plant was accordingly erected near the central mixing plant to comply with the city order. This bin, loaded by day, was available at night when materials ran low at the proportioning plant.

The aggregate storage bin on the proportioning plant had three compartments, one for sand and the other two for different sizes of gravel. An accurately weighed mix was required to insure uniformity in color and high strength tests. The central mixing plant was of semi-automatic operation.

Acknowledgments.—The bins and the proportioning plant were manufactured by the Butler Bin Company, Waukesha, Wis. The pumping system for distributing concrete by pipe line was supplied by the Chain Belt Company, of Milwaukee. The job was a PWA project, as stated, and was built by the Kramp Construction Company, of Berlin, Wis., with Dan Krause as superintendent in charge of operations. The Milwaukee city water department and the U. S. Engineering department also assisted. The project involves an expenditure of about $4,100,000.

Private Building Gains Steadily

THE accompanying chart, based on the F. W. Dodge construction reports covering the 37 states east of the Rocky Mountains, shows construction contracts maintaining a slow, but steady, climb since early in 1935. The uncompleted line indicates the contract curve for this year, the second half of September having reached more than 50 per cent of the 1923-1925 average. The heavier completed line shows the contracts for 1934, and the remaining line indicates the year 1933.



Private contracts have made a much greater gain than is indicated by this chart, the reason being that the substantial gain in private construction was in part offset by reduced public works.

75,000 See Concrete Home in Opening Week

• Built as Demonstration Home in Down-Town Section of Salt Lake City—Structure Is Proof Against Fire, Earthquakes and Termites

IN one week no less than 75,000 people visited the concrete home here illustrated—a monolithic reinforced concrete home of ultra-modern architecture, built on a prominent corner in the down-town business section of a large city, supplied with the most modern equipment, and all rooms completely furnished.

Built as Exhibit

These are the high points of this demonstration home of fireproof concrete construction, built by the E. B. Wicks Company, a real estate firm of Salt Lake City, Utah, as a private promotional enterprise.

As a display of business courage and originality this whole undertaking has rarely been equalled[1]. In consequence, it is most gratifying to know that the venture has been a success. Not only have hordes of people visited this demonstration home, but sales have been made. A second home of similar design and construction has been completed, and a third is under construction.

Later Use as Office Building

This modernistic concrete house was built, in truth, as a demonstration home. Fifteen local merchants and dealers joined forces in the exhibit, and installed complete equipment, furnishings, and interior decorating, so that the public might not only see an example of modern fireproof construction, but modern equipment, furnishings, and decorations as well.

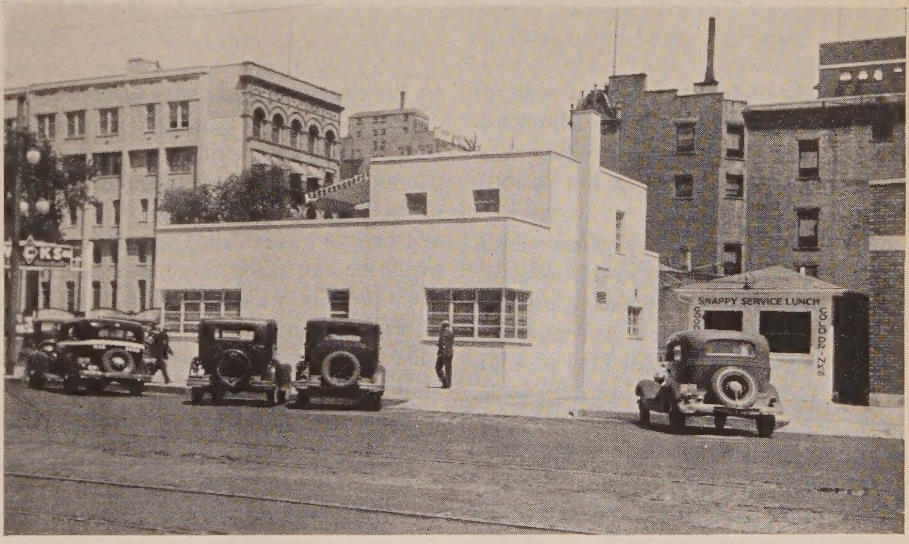
Following the use of the home and its contents as an exhibit, for a period of some months, it will be occupied by the offices of the builder—the E. B. Wicks Company—and the Federal Building and Loan Association. The location is at State and First South Sts.

Arrangement and Construction

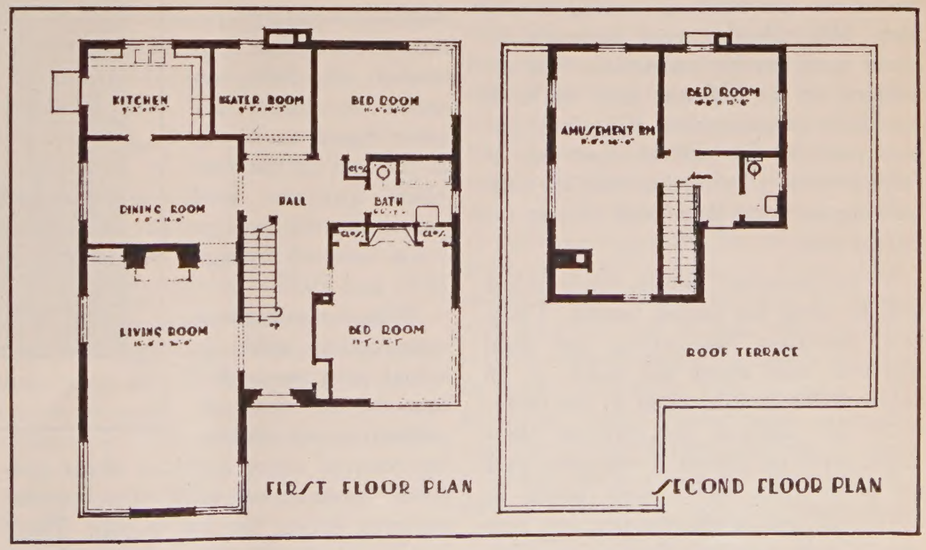
There is no basement under this 7-room home. On the first floor there is a large living room, a dining room, a kitchen, two bed rooms, bath room and heating room. On the second floor is a large recreation room, a nursery and a lavatory; and in addition, the large flat-roof area is available as a children's playground and for the general family activities. The heating room on the first floor contains a modern central heating plant, designed for natural gas fuel, and air-conditioning equipment.

The building has monolithic reinforced concrete walls, and interior partitions of a cinder block plaster mixture deposited in special forms. Floors are of reinforced concrete construction, covered with linoleum. The exterior walls, as stated, are of reinforced concrete; but they are insulated with an inner facing of unreinforced cinder concrete. The exterior consists of a two-coat application of portland cement stucco.

The flat-roof construction consists of highly-reinforced structural concrete, built with special forms. This struc-



Reinforced concrete demonstration home in down-town business section of Salt Lake City, to be used later as an office building. Slack W. Winburn, architect



First and second floor plans of reinforced concrete demonstration home tural concrete slab is covered with *Cel-o-tex,* then with regular roofing material, and a finish layer of roof decking.

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[1] The June (1935) issue of CONCRETE, on page 22, tells of a similar project developed at Spencer, Iowa, by A. P. Nelson, a concrete products manufacturer.

Proof Against Fire and Earthquakes

It will thus be seen that this home is of fireproof construction throughout. It's monolithic walls, floors and partitions make the structure proof against damage from earthquake shocks; and the absence of wood in the construction is a definite safeguard against the attack of termites.

Brief mention should be made of the fact that the builder of this demonstration home did not stop with the mere construction of the building. A definite system has been worked out through which prospective home owners are offered a complete building service, including help in the selection of a lot, engaging competent architects and builders, supervision of construction, and financing. In the matter of financing, three types of loans are made available—the straight mortgage, the FHA plan, or the loan association amortized mortgage plan.

Acknowledgments: The architect who designed this home is Slack W. Winburn, of Salt Lake City; and the construction contract was awarded to Ray W. Dundas, of the same city. As previously mentioned, the builder and promoter of this demonstration home is the E. B. Wicks Company, a prominent real estate concern of Salt Lake City.

Architect Demands Sidewalks Along Highways

Urges Highway Commissions to Reduce Fatalities Due to Walking on Paved Roadways

Editor, CONCRETE: I have a copy of the September, 1935, issue of CONCRETE. I am always interested in looking over the magazine and reading the articles and editorials.

In regard to highway construction and the spending of Federal funds for that purpose, it has occurred to me that you might put forward a suggestion which I have made to members of Congress in regard to our public highways.

The death toll alone on public highways due to accidents is appalling, not to mention property damage or personal injury. Many times accidents are caused by pedestrians walking on the concrete highway. The motorist endeavors to avoid the pedestrian and strikes the car which is coming toward him. Many deaths occur annually because motorists hit pedestrians that are walking on the highway after dark. If you drive an automobile after dark, you have undoubtedly had the experience of failing to see a pedestrian who has been walking in your lane until almost too late to stop.

In my opinion, public funds might well be spent for public benefit. I suggest, therefore, that along our main highways and about the width of an automobile—that is, eight to ten feet—from the edge of the concrete there might well be placed a concrete walk for pedestrians, which walk would be about four feet wide, enabling two people to walk abreast. Pedestrians walk on the concrete, as usually the shoulders of the road are rough, and in the dark one is quite apt to turn his ankle. You cannot blame the pedestrian for wishing to walk on a smooth surface. If there is a concrete sidewalk four feet wide on which he can walk, there will be no excuse for his walking in the roadway. It will eliminate this hazard. If the walk is to be eight feet from the concrete it will permit a car driver to stop his car off of the concrete so that he will not block the traffic. Finally, if a concrete walk four feet wide is put in, I do not know whether there are concrete paving machines to cover only four feet, in which case a vast number of men would be employed in grading the walks and in placing the concrete. The benefits to be derived take the pedestrian off the highway, eliminate cause of accidents, employ a great amount of labor for the benefit of the public.

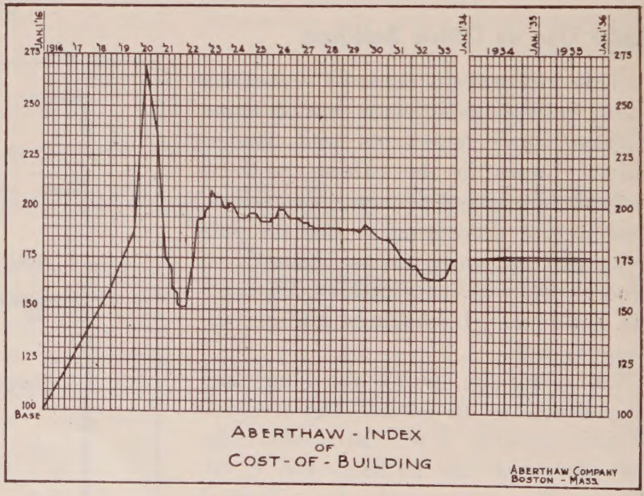
Possibly you may be interested in putting this suggestion forward in your magazine and induce the highway commissioners in the various states to adopt the idea in some form or other.

CASS GILBERT, JR.
Architect, 244 Madison Ave.
New York City

September 4, 1935

Aberthaw Index of Building Cost

THE Aberthaw index of cost of industrial building for the quarter ending September 30, 1935, remains at 176.5, the same figure as it was at the end of the previous quarter, and practically the same as it has been all through 1934 and 1935.



While the volume of construction work in actual progress is still low, the Aberthaw organization reports having received many inquiries about proposed construction work from private concerns during the last month. There is also a considerable volume of new government work about to proceed. It is believed that building costs are more likely to advance than to decline from present levels.

Flexural Strength Predetermined

Proportioning Concrete to Provide Definite Flexural Strength for Pavement Construction—More Important Than Compressive Strength

By E. W. BAUMAN
Engineer of Materials and Tests, Tennessee Department of Highways, Nashville, Tenn.

WHEN it is realized that some 100,000 miles of equivalent 18-ft. concrete pavement constructed over highways, streets, and alleys in the United States have had as the basis for strength in the design or proportioning of the concrete for the most part that of compression, when as a matter of fact the critical stress to which slab concrete is subjected is in flexure, then it is apparent that much of this concrete has been either over or under-designed for the loads to be carried. Some of it may have resulted accidentally in obtaining the proper flexural strength to serve for the conditions imposed.

Overlooking the Flexural Strength

Highway engineers readily accepted the findings resulting from the Bates experimental section in Illinois with regard to design of the slab structure, for since results from this project were published in 1924[1], almost all concrete pavements constructed have had thickened edges to reinforce the corners to provide for a continuous strengthened section along the points where the pavement was likely to be unsupported by the subgrade; also, the use of the longitudinal dowel joint intended to reduce corner warping.

The very basis for arriving at the proper edge thickness, using the accepted formula $d = \sqrt{\dfrac{3W}{S}}$, embodies the use of the flexural strength of the concrete. In the formula, S is the value representing not more than one-half the modulus of rupture of the concrete; so, for design purposes, engineers have generally accepted the value of 300 or 350 lb. for S, assuming thereby a concrete of 600 to 700 lb. per sq. in. modulus of rupture. Much of the concrete placed even today for slab construction does not yield 700 lb. modulus of rupture, notwithstanding the fact that a high compressive strength is usually specified and obtained; so if the basis for the formula used in designing slab thickness is correct, then it is obviously important that concrete should be designed to produce a definite flexural strength for concrete slabs as measured by the modulus of rupture.

No Direct Relation

We had, as early as 1922, some rather definite knowledge that the principles governing flexural strength of concrete were not in direct relation to those controlling or influencing the compressive strength. Undoubtedly, the first major laboratory project dealing with flexural tests of concrete was that conducted by the Portland Cement Association in cooperation with the Lewis Institute, reported by D. A. Abrams, in *Flexural Strength of Plain Concrete*[2]. Results of this investigation indicated that (a) "The relation between modulus of rupture and compressive strength is not uniform." (b) "The modulus of rupture was less affected by variations in the quantity of cement than was the compressive strength," and (c) "The modulus of rupture was less affected by the change in mixing water than was the compressive strength."

The type of coarse aggregate used in concrete influences the flexural strength much more than is the case with compressive strength. The New Jersey tests conducted in 1926 and reported in 1928[3] show that there was as much as 12 per cent higher flexural strength in concrete containing one coarse aggregate than in concrete containing another type of coarse aggregate, whereas there was practically no difference in the crushing strength of these two concretes. Likewise, test series 210 of the Portland Cement Association, results of which are carried in the 1928 report of the director of research, show that "an aggregate which produces a concrete of high compressive strength may not necessarily give high strengths in flexure."

Factors Controlling Flexural Strength

In addition to the type of coarse aggregate influencing the strength, the size or gradation of the coarse aggregate also enters into the problem. Results of tests conducted in the Tennessee Highway laboratory indicate that the 1-in. maximum size aggregate produces higher flexural strength than the 1½-in. maximum from the same source; likewise, the 1½-in. maximum size aggregate produces concrete with slightly higher flexural strengths than the 2-in. size. This relation has also been developed in other laboratories, and especially so in the tests conducted by the Bureau of Public Roads. In a test series reported by W. F. Kellerman on *Effect of Size of Specimens, Size of Aggregate, and Method of Loading Upon the Uniformity of Flexural Strength Tests*[4], it was shown that "for all test conditions, decreasing the maximum size of the aggregates increased the modulus of rupture." This, in a general way, is contrary to the behavior in compressive results.

It would seem from the foregoing facts that highway engineers should have adopted more generally, long before this, a basis or procedure for proportioning concrete to produce a predetermined flexural strength. Perhaps it was because the water-cement ratio law had been so universally adopted by concrete technicians, and such a preponderance of data from various concrete investigations was available relating to its behavior with respect to compressive strength, that it was easy for the highway group to fall in line with the procedure worked out for engineers dealing in mass concrete or with building construction, where compressive strength was the critical factor. Besides, it was not until recently that we had anything definite regarding test technique and laboratory procedure for determining with reasonable accuracy the modulus of rupture of concrete. Comprehensive tests carried co-operatively among several states during the past few years established with reasonable surety the size of beam, length of span, rate of loading, et cetera, to adopt for determining flexural strength of concrete[5]. From these results and the work of members of Committee C-9, the American Society for Testing Materials has been enabled to draw up tentatively a test procedure, designated as Serial C78-30T. Tests have shown that molded beam specimens are representative of the concrete in the slab. Studies of pavement concrete reported by Jackson and Kellerman[6] present this conclusion: "For concrete reasonably free from honeycomb, the strength of the control beams appeared to be a satisfactory measure of the strength of the corresponding pavement slab."

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[1] Proceedings A.S.C.E. Vol. 1, No. 2, 1924.

[2] Proceedings of American Concrete Institute, Vol. XVIII, 1922.

[3] Public Roads, Vol. 8, No. 12, February, 1928.

[4] Public Roads, Vol. 13, No. 11.

Method of Design Needed

Even though certain principles dealing with the flexural strength are known, and there is available a tentative test procedure for determining this strength, there yet remains to be developed, and most important of all, a method for designing concrete by co-ordinating these principles on the basis of certain elementary tests of the ingredients, which will enable the engineer to predict with reasonable accuracy the flexural strength of concrete produced by the resultant mixture. Until such time as a satisfactory method is developed, highway engineers attempting to control the flexural properties of concrete will more than likely have to make laboratory trial mixtures, using aggregate combinations intended for actual project uses and taking results obtained for setting up the job proportions. At the outset it is apparent that a vast amount of laboratory work is entailed by this plan, for the average highway department.

Anyone who is familiar with highway construction programs undertaken by the various states during the past decade recognizes the complexity of aggregate combinations which go into the network of this program. In the latest specifications of the American Association of State Highway Officials for concrete pavement (1935), the requirements for concrete proportioning are as follows: "The 'job mix' shall be that mix which in the judgment of the engineer, based on laboratory testing of the job materials actually furnished, will assure durable concrete of the plasticity and workability required, and will attain in 14 days a *modulus of rupture of not less than* 600 *lb. per sq. in.* when tested by A.S.T.M. Method Designation C78-30T." As a rule the specifications approved by the A.A.S.H.O. are generally followed by a majority of the state highway departments, so that in the near future many highway construction engineers will more than likely be calling on the laboratories for concrete proportions yielding a specified flexural strength.

Procedure in Tennessee

In 1931 the Tennessee Department of Highways, for reasons apparent within the state, decided to change from compressive to flexural strength for controlling the quality of concrete to be used in slab construction. It is the purpose of this article to relate some experiences gained thereby, and to outline the procedure followed in the laboratory in attempting to proportion concrete for pavement construction to yield a fixed flexural strength. The method is based on solid volume of the ingredients, which in turn is based on laboratory trial mixtures.

With concrete aggregates (sand, gravel, and crushed stone) available to the department from some 43 commercial producers, and cement from about 15 different mills, it is apparent that the number of mathematical combinations possible from this grouping would be so large as to make it impractical to test each in the laboratory. For all practical purposes, the combinations of fine to coarse aggregate are usually established by the limitations of freight rates and competition among the producers, resulting in perhaps only one from each plant, and only these need be considered in a test program. A letter was addressed to all interested producers, informing them that a test program would be undertaken in the laboratory, and that if they wished aggregates from their sources tested to determine proportions necessary for producing a specified flexural strength, they were to forward to the laboratory, by prepaid express, samples of designated weight for this purpose.

Test Methods

Marketing operations of cement are different, however, and it is possible for any one of the 15 brands available to be used with any aggregate combination, thereby again complicating the problem for the laboratory. An examination of records on file relating to the tensile strength of the various cements used by the department over a period of several years, showed that the brands most commonly used produced tensile strength results at a 28-day age which did not differ as much as 10 per cent between the highest and lowest; and on the basis of the average, only a maximum of 5 per cent variation existed. While there is a difference of opinion among authorities regarding the effect of the quality of cement upon the strength of concrete, it is generally recognized that a relation does exist between tensile strength of cement and strength of concrete. Since the brands available to the department were more or less uniform in strength behavior, it was decided that only one brand of cement would be used with the trial batches of different aggregate combinations to be worked up in the laboratory. If, however, a marked difference were to exist in briquette strengths of various brands, it would be advisable to make recognition of this condition in any test program undertaken. The cement selected was one which gave tensile strengths lower than the average of all.

Schedule Prepared

When the aggregates which were shipped to the laboratory by the producers were all on hand, a schedule was worked up to accommodate one cycle of three different combinations, along with a standard set, for a day's run. Two beams, 6 by 6 by 34 in., and one cylinder from each combination, constituted one cycle. Each combination was to be tested in three cycles. The day following a pouring was used in cleaning up the concrete laboratory, taking specimens from the forms and placing them in the moist room. By pouring concrete every other day, three combinations were completed in one week. All operations relating to mixing concrete, molding, and testing of specimens, were under the direct supervision of the research engineer, assisted by three Materials Inspectors who were in from the field for the winter months.

(*The next installment of this article will take up a detailed description of the methods employed in arriving at the proportions of materials required to produce the specified modulus of rupture.—Editor.*)

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[5] Public Roads, Vol. 12, No. 2.

[6] Public Roads, Vol. 12, No. 8.

Rehabilitate Old Building for University

Metal Lath and Cement Stucco Form Winning Combination — How Down-Town Loft Building Was Modernized

By E. M. LURIE
Secretary, Metal Lath Manufacturers Association, Chicago, Ill.

METAL lath and portland cement stucco—a highly efficient combination of materials that has accomplished the complete rehabilitation of so many old buildings—were employed with characteristic success in the conversion of an old loft building into a down-town school for Loyola University, of Chicago.

Loft Building to University

In this building, located at 28 North Franklin St., the university houses its schools of law, commerce, and sociology, as well as the graduate school of the university.

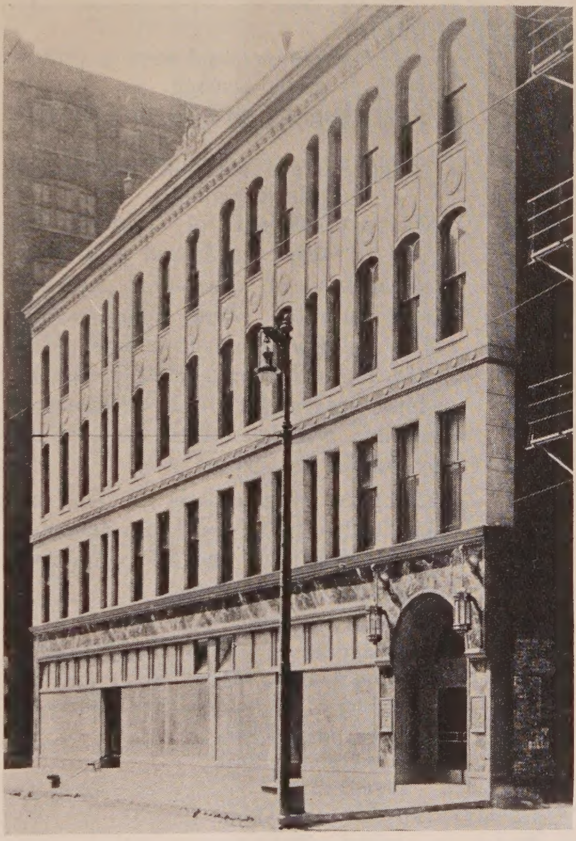
Formerly the upper floors of the building were lofts. The old exterior surface was of brick, which had grown colorless and grimy with age. When the university took it over, both the interior and the exterior were completely remodeled to fit the new requirements.

The interior of the building was divided into class rooms and lecture rooms, and all the old walls and ceilings were surfaced with metal lath and plaster.

How Building Was Resurfaced

The brick exterior was completely overcoated with a new and durable shell of metal lath and portland cement stucco. The lath was attached to the old brickwork in the usual way. Pencil rods (steel rods ¼ in. in diameter) were set vertically against the brick, about 8 in. apart, and were stapled to the brickwork by driving 2-in. staples into every sixth mortar joint. The metal lath, placed in horizontal strips slightly overlapping each other, then was stapled securely to the pencil rods, by means of the 2-in. staples previously mentioned. These were driven over the pencil rods and into every second mortar joint.

From the foregoing it will be seen that the metal lath reinforcement was placed about ¼ in. from the face of the old brick wall. This provided space for the scratch coat of cement stucco, which was applied by hand, as were the brown coat and the final coat.



A shell of metal lath and portland cement stucco, rigidly secured to the old brick wall surface, plus interior rehabilitation, transformed an old loft building into this downtown university building

Applying the Stucco

The scratch coat was of a thickness sufficient to fill the space back of the metal lath, partly embedding the lath.

After a suitable period of hardening, the second, or brown coat, was applied to a thickness that completely covered and protected the metal lath.

The final coat, consisting of a light buff-colored portland cement stucco, then was applied, and before the stucco had hardened it was scored to give it a texture similar to cut limestone. At the same time, courses were marked off to produce the effect of stone courses; and, in fact, the finished work has the appearance of cut stone.

The belt course and the ornamental panels beneath the top story windows were colored to a shade distinctly darker than the buff-colored stucco, thereby breaking the monotony.

Proof of Durability

This is another example of the unlimited uses of portland cement stucco on metal lath, to renovate old exteriors, of any type of building. The furring steel can be used to create new form, build out around openings, or in a great variety of ways to change the whole appearance of the building. The cement stucco is durable, as all concrete is, and will last as long as the building stands.

The Kalteux-Brown Company, of Chicago, had the contract for the exterior stucco work and the interior metal lath and plaster work on this building. Although the work was done 14 years ago, it remains in perfect condition, and stands as a proof of the substantial and permanent character of this type of resurfacing.

LARGE CONCRETE PILES

Their Design, Manufacture and Handling —Economy of Larger Piles Due to Great Load-Carrying Capacity

THE economy of concrete piles may be measured in units of load-carrying capacity—not in number of piles or linear feet. A large pile, costing \$70 in place, that will carry 70 tons is more economical than two piles costing \$40 each that will carry a total of 50 tons.

The only limitation on the size of concrete piles is the equipment necessary to handle and drive them.

For hundreds of years the natural growth of trees governed the size and length of piles. Man had to take what he found and, through long experience enriched somewhat by slowly developed theory, a practice and technique in the use of piles grew around the limitations imposed by nature's supply of ready-made material. Thus, the technique of construction crystallized on handling and driving wood piles and the load-carrying capacity, both by formula and experience, was based on a relatively small and non-uniform size.

The development and manufacture of concrete piles has removed nature's limitation on the size, and hence the carrying power, of piles.

Large vs. Small Piles

A pile carries its load by direct pressure on the "point," and by "skin friction." In most instances, the latter is the more important. In most soils the skin friction on piles not in a cluster is increased by compression of the surrounding earth in driving—the larger the pile, the greater, in extent at least, the compression. A cluster of piles may yield by subsidence of the "bulb of pressure" in which case the entire cluster settles, and the average load carried per pile may be less than the load a single pile in the same soil would carry.

In a trestle bent, the fewer piles used, the farther apart they will be, and consequently the condition for their action as individual piles is better satisfied. The load on each pile of a 3-pile trestle bent can, with propriety, be taken as equivalent to the capacity of an individual pile in the same soil.

Since the bearing power of an individual pile is equal to point bearing plus skin friction, we have, as a comparison of pile capacities—

Pile section area × direct bearing on soil at "point" + surface area in ground × coefficient of friction. This is represented very simply by,

$Ap + Sc$ ....(1)

in which

A = Cross-sectional area of pile in direct bearing.

p = Direct bearing power of soil.

S = Surface area of portion of pile in ground.

c = Coefficient of friction between earth and pile.

Regardless of theoretical bearing-power formulas (some complicated), (1) is a simple statement of how a pile carries its load. For a reliable estimate of total capacity it is only necessary to determine p and c for the soils at the site and for the size of piles.

Compare on this basis the load capacity of two piles, one 11-in. diameter, round, and a larger one, 24-in. diameter and octagonal in section:

Sectional area, 24-in. octagonal = 3.31 sq. ft.
Sectional area, 11-in. round = .66 sq. ft.
Surface area 24-in. octagonal—20-ft. penetration = 132 sq. ft.
Surface area 11-in. round—20-ft. penetration = 57 sq. ft.

Thus, the large pile has 5 times the point bearing and 2-1/3 times the surface area in contact wtih the soil.

Interpreting this by assigning values to direct bearing on soil and coefficient of skin friction, we have, for bearing on soil = 10 tons; and coefficient of friction = 1,000 lb. per sq. ft.

Bearing, 24-in. octagon pile $= 3.31 \times 10 = 33.1$

Friction, 24-in. octagon pile $= 132 \times \frac{1000}{2000} = 66.0$

Total for 24-in. pile..............99.1 tons

Bearing, 11-in. tapered round pile $= .66 \times 10 = 6.6$

Friction 11-in. tapered round pile $= 57 \times \frac{1000}{2000} = 28.5$

Total for 11-in. pile..............35.1 tons

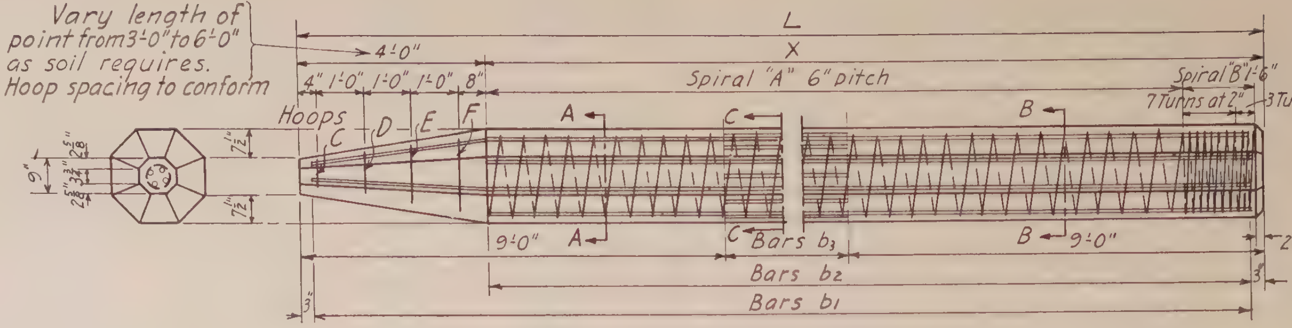
Thus, the 24-in. pile has 2.8 times the load capacity of the 11-in. round pile. Loading tests show this comparison to be conservative, for four reasons. This example makes no allowance for (1) higher coefficient of friction from greater ground compaction around the larger pile, nor for (2) greater adhesion between the earth and the rough concrete surface. (3) It also assumes that the soil bearing power p is the same whether the bearing area is partly in the taper, or at the point as is the case with the concrete pile. A tapered pile of 11-in. average diameter may have a 14-in. butt and only an 8-in. point. Assuming that the pile has been successful in reaching a hard stratum, the *average* unit vertical bearing power of the taper may be only about one-fourth of that at the point, and the total "point" bearing capacity of the pile 4.3 instead of 6.6 tons. (4) The skin friction coefficient probably increases with the depth penetrated, in which case the area of the tapered pile is least where the friction is greatest.

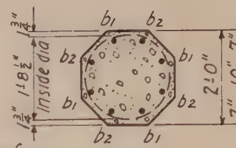
Design

The detailed line drawing shows the design for 24-in. concrete piles of the American Railway Engineering Association (Bulletin No. 374, page 855).

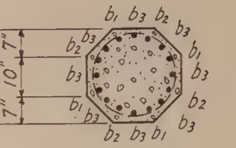
Except for very heavily loaded piles deriving their principal support from "point" bearing on a hard stratum, the column strength of piles is not even approached. The line drawing shows column load capacities of 24-in. octagon piles computed for class 3,500 concrete (A.R.E.A. Manual 1929) of from 160 tons to 215 tons for an unsupported length of 12 times the diameter. Applying the load reduction formula (A.R.E.A.) for unsupported length, we have 75 tons capacity for unsupported lengths of from 62 ft. to 71 ft. These data show that in the design of ordinary concrete piles it is only necessary to provide sufficient reinforcement for handling and shipping, and that the pile so designed will have several times the load capacity as a column that it will be called upon to carry as a pile. In other words, piles are designed as *piles*—not as columns.

From bulletin issued by the Portland Cement Association.

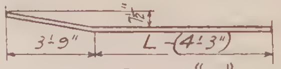




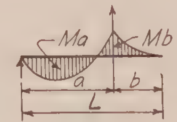
SECTION A-A & BB
FOR ALL PILES



SECTION CC
FOR ALL PILES
HAVING "b3" BARS

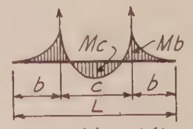


BARS "b1"



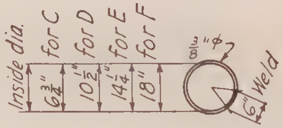
For Ma = Mb
a = 0.707L b = 0.293L

ONE POINT PICKUP



For Mc = Mb
b = 0.207L c = 0.586L

TWO POINT PICKUP



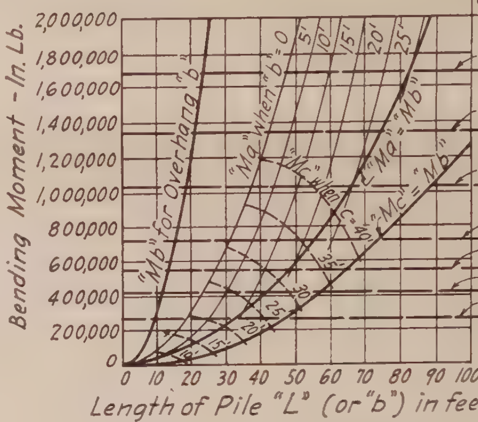
HOOPS C-D-E-F

1-Bar-⅜"x 1'-10½" - C
1-Bar-⅜"x 2'-10" - D
1-Bar-⅜"x 3'-10" - E
1-Bar-⅜"x 4'-10" - F

HANDLING STRESSES

For One Point Pickup.
"Ma" governs the design above the line Ma = Mb

For a Yoke or Two Point Pickup.
"Mc" governs above the line Mc = Mb.



Resisting Moment when reinforced with	*Column Strength P in Lb.	**Unsupported Length for P' = 75 Tons
16-1"□	429,000	71'
16-1"○	400,000	69'
16-⅞"○	379,000	67'
8-1"○	352,000	65'
8-⅞"○	340,000	64'
8-¾"○	330,000	63'
8-⅝"○	321,000	62'

*P Computed as a tied column.
** From $\frac{P'}{P} = (1.33 - \frac{h}{72})$

REINFORCEMENT REQUIRED FOR HANDLING

BILL OF BARS (FOR PILES WITH 4FT POINT)

Length L	Straight X	LONGITUDINALS								SPIRALS						HOOPS				Vol. of Pile C.Y.	Wt. of Pile Lb.
		b1 (bent)			b2		b3		Wt. in Lb.		A			B		C	D	E	F		
		Size	No.	Length	No.	Length	No.	Length			No.	No. of Turns	Wt. Lb.	No.	Wt. Lb.						
20'	16'	⅝"○	4	19'-6"	4	15'-9"			147	#4 Wire (B.W.G.) 2-1" Spacer ⌊s Finish ends with 1½ flat turns	One	29	48	One	10	One (Wt. 9 Lb.)	One (Wt. 13 Lb.)	One (Wt. 16 Lb.)	One (Wt. 20 Lb.)	2.22	9000
25'	21'	⅝"○	4	24'-6"	4	20'-9"			189			39	64							2.83	11900
30'	26'	¾"○	4	29'-6"	4	25'-9"			232			49	80							3.45	14000
35'	31'	⅞"○	4	34'-6"	4	30'-9"			532			59	96							4.06	16500
40'	36'	⅞"○	4	39'-6"	4	35'-9"	8	22'-0"	975			69	112							4.68	18900
45'	41'	⅞"○	4	44'-6"	4	40'-9"	8	27'-0"	1140			79	128							5.29	21400
50'	46'	1"○	4	49'-6"	4	45'-9"	8	32'-0"	1700			89	144							5.91	24000
55'	51'	1"○	4	54'-6"	4	50'-9"	8	37'-0"	1910		Two	49	160							6.52	26400
60'	56'	1"○	4	59'-6"	4	55'-9"	8	42'-0"	2125			54	178							7.14	28900

Cross Section	477 sq.in.
Perimeter	79 in.
Core diameter	21 in.
Core area	346 sq.in.
Concrete in 4ft. point	0.248 c.y.
Concrete in "X" per ft.	0.123 c.y.
Weight of point (4ft.)	1000 Lb.
Weight of "X" per ft.	498 Lb.

GENERAL NOTES

Specifications from A.R.E.A. Manual.
Class of concrete 3500
Permissible pile load P' = 75 tons

24" REINFORCED CONCRETE OCTAGONAL PILE

Choice of Cross-Section

The shape of the pile section is influenced by considerations of appearance, manufacture, handling, driving and cost. Appearance is often of little importance, and individual preference will govern the choice of square, hexagonal, octagonal or circular sections.

Advantages of the Square Section: Placement of concrete and positioning of reinforcement simplified; effective depth for handling moments greater; surface area greater for given cross-sectional area than for other sections; forms simple and removal of piles facilitated.

Disadvantages: Assembly of reinforcement into square cages is somewhat higher in labor cost, since fabricated spirals or completely assembled cages can be purchased for a circular assembly of reinforcement. In some soils, especially where boulders and other obstructions are encountered, the square section may tend to rotate in driving, more than is the case with other sections.

Other factors influencing choice of shape are obscure. Certainly, computation of effective depth for resistance to bending of hexagon, octagon and circular sections is complicated as compared with the square section. The square section will nest better in stacking and shipping than any other section.

The detailed line drawing shows a minimum covering of reinforcement of 1¾ in., less the thickness of the hooping. A minimum covering of 1 in. is provided in the A.R.E.A. general specifications for concrete and 3 in. for reinforced concrete in sea water. These coverings are ample, but should not be violated by careless placement of reinforcement.

Manufacture

The casting plant should be located at a point where materials and labor are cheap. Sufficient space should be available to establish an efficient routine or "flow line" of operations.

Starting at one end, it is usually recommended that the flow line include the reinforcement cage assembly with bar storage racks, bending tables, templates for holding longitudinal bars, and assembly "horses." Next comes the casting section proper, including forms in gangs of sufficient number to permit continuous casting. The casting crew cleans and lines forms, positions reinforcement cages, and works the concrete into place.

For intermittent operation it may be most economical to purchase concrete from a commercial ready-mix plant, thus avoiding overhead charges on idle equipment. Vibratory placement of concrete will permit the use of a lower water-cement ratio, and therefore shorten the initial curing period required to attain 2,500-lb. strength. For continuous operation, this saving in time reduces the number of forms required and therefore the cost of manufacture.

Shipping and Handling

Since economical design requires that no more reinforcement be used than necessary for handling, it is important that the stresses provided for be not greatly exceeded either in handling or shipping. Stresses resulting from insufficient support of piles while in transit may easily exceed those provided for in handling.

The resisting moment of 24-in. octagon piles, based on working unit stresses in the steel, is shown in the line drawing. It is suggested that the computable stress, based on the spacing of blocking under piles on cars, should not exceed 2/3 of this moment to provide additional safety against movement of the blocks in transit, uneven level of blocks or distribution of load, and vibration and jarring in transit.

Shipping and handling stresses may exceed the working stresses used in design without material injury to the piles, so long as they are well within the elastic limit of the steel. Distributed and relatively small tension cracks in piles are not serious because, under load, piles are in compression and simple tension cracks are tightly closed.

(*The next installment of this article will describe the handling and driving equipment necessary in the use of large reinforced concrete piles, and some cost data will be given.—Editor.*)

Build Concrete Work All Winter

(An Editorial)

SUCCESSFUL methods for building concrete work throughout the winter months have become so well established in the construction industry that a contractor who deliberately avoids such work should be regarded as a back number.

Even in concrete road and street pavements, formerly considered impossible to place in winter, a definite winter construction practice has been developed. A number of articles in CONCRETE—particularly in the issues of January, April, May, June and December, 1934, and in January, February, April and May of this year — have developed the practical rules and methods of procedure.

The essential rules of winter concreting in general have, likewise, been given in various issues of this magazine, as in the issues of December (1934), page 5, and December (1933), page 8. These and other articles contain the rules of practice for placing concrete work in buildings and other structures during the winter months, as developed by large construction companies.

Readers who do not have the above-mentioned issues of CONCRETE available may, however, obtain an excellent printed folder on *Concreting in Cold Weather*, by writing to the Portland Cement Association, 33 W. Grand Ave., Chicago.

Aside from some good illustrations of winter concreting methods, the printed folder just mentioned contains detailed specifications for making, placing and curing concrete in cold weather, and a set of instructions for the protection of reinforced concrete work placed in winter.

Not only contractors, but architects and engineers as well, should have this printed folder at hand, single copies of which may be obtained from the Association without charge.

◆ EDITORIAL ◆

Large-Scale Modernizing

Several statistical organizations that devote considerable attention to trends and developments in the building industry recently have commented on the likelihood that large-scale modernization of buildings will play an increasingly important part in construction.

A strong indication in this direction is shown in the chart printed on page 12 of the September issue of CONCRETE. Since the beginning of 1933 the volume of building modernization has shown a general upward trend.

The recent change in the National Housing Act, through which the limit on modernization loans insurable under the Act has been increased to $50,000, is the cause back of the belief that owners of structures such as retail store buildings, apartment houses, commercial garages, factories, dairies, and the like will now be inclined to modernize their plants.

Certain it is that many establishments of these types are sorely in need of new store fronts, new exterior treatments, new interior finish, modern plumbing, new floors, basements, driveways, garages, or various other improvements.

Many owners, without being prompted, will see the advantages of modernizing. Many others will act only if attractive architectural sketches and carefully-prepared estimates of cost and of probable financial return are presented to them.

Each piece of income-bearing property and each commercial garage or industrial plant constitutes a separate problem that requires thorough study and analysis. Contractors and concrete products manufacturers, working in co-operation with architects and engineers, will be able to push many a modernizing project to the contract stage.

Flexural Strength Neglected

In an article in this issue, by E. W. Bauman, engineer of materials and tests for the Tennessee Department of Highways, the author builds up a strong case in favor of flexural strength as the determining factor in gauging the quality of pavement concrete.

There is no question that highway engineers have been placing too much emphasis on compressive strength, and not enough emphasis on flexural strength; for, after all, pavement concrete is supported on a yielding foundation, and its severest punishment arises from the flexural stresses to which it is subjected, rather than from direct compression.

Mr. Bauman does not mean to convey the impression that flexure alone needs to be considered, though one who reads his article too hastily might draw that inference. The Tennessee specifications, under which he operates, do make flexural strength the principal controlling factor; but these same specifications do not overlook other factors, such as minimum compressive strength, maximum water-cement ratio, minimum cement content, and range of slump. For all of these controlling factors, limiting values are established.

Highway engineers must plead guilty to the charge of having missed the importance of flexural strength. Of the highway department specifications of 48 states and the District of Columbia, 25 contain no requirement pertaining to flexural strength—no established minimum value for the modulus of rupture. Two states provide for consideration of this factor under certain conditions; and five states set the minimum value for modulus of rupture at less than 600 pounds per square inch. Only 17 states can be regarded as having adequate requirements, ranging in value from 600 to 800 pounds per square inch.

Perhaps the greatest need, as Mr. Bauman suggests, is the development of a method of procedure for predetermining the flexural strength of pavement concrete. Here is where research activities again must come to the rescue. When this problem is solved, highway engineers will find it less difficult to write this important factor into their specifications.

First Prize Is $1,250

Architects, products manufacturers, builders of concrete homes, and any others who have had some part in the construction of an outstanding concrete home built during 1935 should enter their creation in the new-homes competition recently announced by the magazine *Better Homes and Gardens.* The first prize will be $1,250.

Homes built anywhere in the United States during 1935 and completed by the end of the year will be eligible for entry. Information pertaining to the contest, and blanks for entering a home, may be obtained in recent issues of that magazine, or from the Meredith Publishing Company, Des Moines, Iowa.

A commendable feature of the competition is the provision for a bonus of 25 per cent of any award, to be paid to the architect who designed the home.

This competition is open to all types of construction. If a concrete home should win against the field, a definite impetus would be given to the popular interest in concrete as a material for fireproof home construction.

PROGRESS—In a Page

Current activities in research, in matters pertaining to concrete and cement, as being carried on or completed by various organized groups.

Rudolph P. Miller Heads Code Committee

RUDOLPH P. MILLER, one of the foremost American building code authorities, was elected chairman of the American Standards Association Building Code Correlating Committee when the committee was organized in Engineers' Building, 29 West 39th Street, New York, on September 17. George N. Thompson, National Bureau of Standards, was named vice-chairman.

The organization of this committee gives a much needed impetus to a necessary movement for cleaning up the present confusing conditions in the building code field.

The correlating committee will supervise the work of several sectional committees which will be assigned to develop building standards and specifications. These will be made available to municipalities in developing their own building codes, and in this way the collected experience of national organizations can be passed on to the local bodies.

Today there are more than 1,600 city building codes in the United States, many of which vary widely as to construction requirements. It is expected that the work of this committee will serve to make building requirements more uniform.

More Welding Schools

EDUCATIONAL opportunities for all persons interested in the oxy-acetylene process of welding and cutting are again being offered through the medium of two welding clinics sponsored by The Linde Air Products Company, 30 East 42nd Street, New York City. The first of these clinics was held October 23, 24, 25, 26 in Sam Houston Convention Hall, Houston, Texas; the second, from October 30 through November 2, at the Georgia School of Technology, Atlanta, Georgia.

Similar meetings held last year in Birmingham, Houston, Cleveland and New Orleans drew the attendance of more than 10,000 engineers, plant executives, welding operators, and others. Daily programs include individual instruction in all types of oxy-acetylene welding and cutting, demonstrations of every-day applications as well as the latest developments in apparatus and technique, discussion groups, and motion pictures. Operators and students are given an opportunity to practice under the direction of men experienced in particular phases of the process; executives and engineers can freely discuss their plant maintenance and production problems with qualified experts.

Rapid Determination of Magnesia

THERE has been consistent demand for a more rapid method of determining magnesia content in portland cement. A special committee of the American Society for Testing Materials made a study of some of the methods which have been proposed at various times, and based on the results of comparative studies by more than twenty co-operating laboratories, two methods were decided upon and will be incorporated in the *Tentative Methods of Chemical Analysis of Portland Cement* (C 114-34 T). The final acceptance was made at a meeting of Committee E-10 on Standards, held on August 22.

The two methods are based on the short methods developed by F. P. Diener, Universal Atlas Cement Co., and J. C. Redman, Battelle Memorial Institute, Columbus. The methods were presented in the appendix to the 1935 annual report of Committee C-1, and are published in full on pages 37 and 38 of the August (1935) *Cement Mill Edition* of CONCRETE.

Flexible Concrete Floors

INSTEAD of the rock-hard floor surface formerly deemed inevitable with fireproof construction, a resilient hard-surface floor is now attainable without recourse to organic materials or sorel cements, according to claims made for a patented process worked out in the Heliopore laboratories.

The theory of construction involves the use of steel joists, light enough to spring under load like wooden joists, instead of the ordinary rigid support demanded for standard concrete slab construction. A half inch, or more, of fibrous material such as Celotex, waterproofed by asphalt above and below, is interposed between the concrete base slab and the surface concrete, which is divided up into articulated sections and anchored to the base by means of special anchor angles (made of brass, copper, or zinc). The resulting floors are resilient, insulated, and crack-proof, and may be given any standard concrete finish, such as terrazzo, granitine, or tile effects.—Mineral Trade Notes, U. S. Bureau of Mines, July 20, 1935.

For Marking Steel Bars

A PROPOSED *Simplified Practice Recommendation Covering a Color Code for Marking Steel in Bars* has been mailed to all interests by the Division of Simplified Practice of the National Bureau of Standards for their consideration and acceptance.

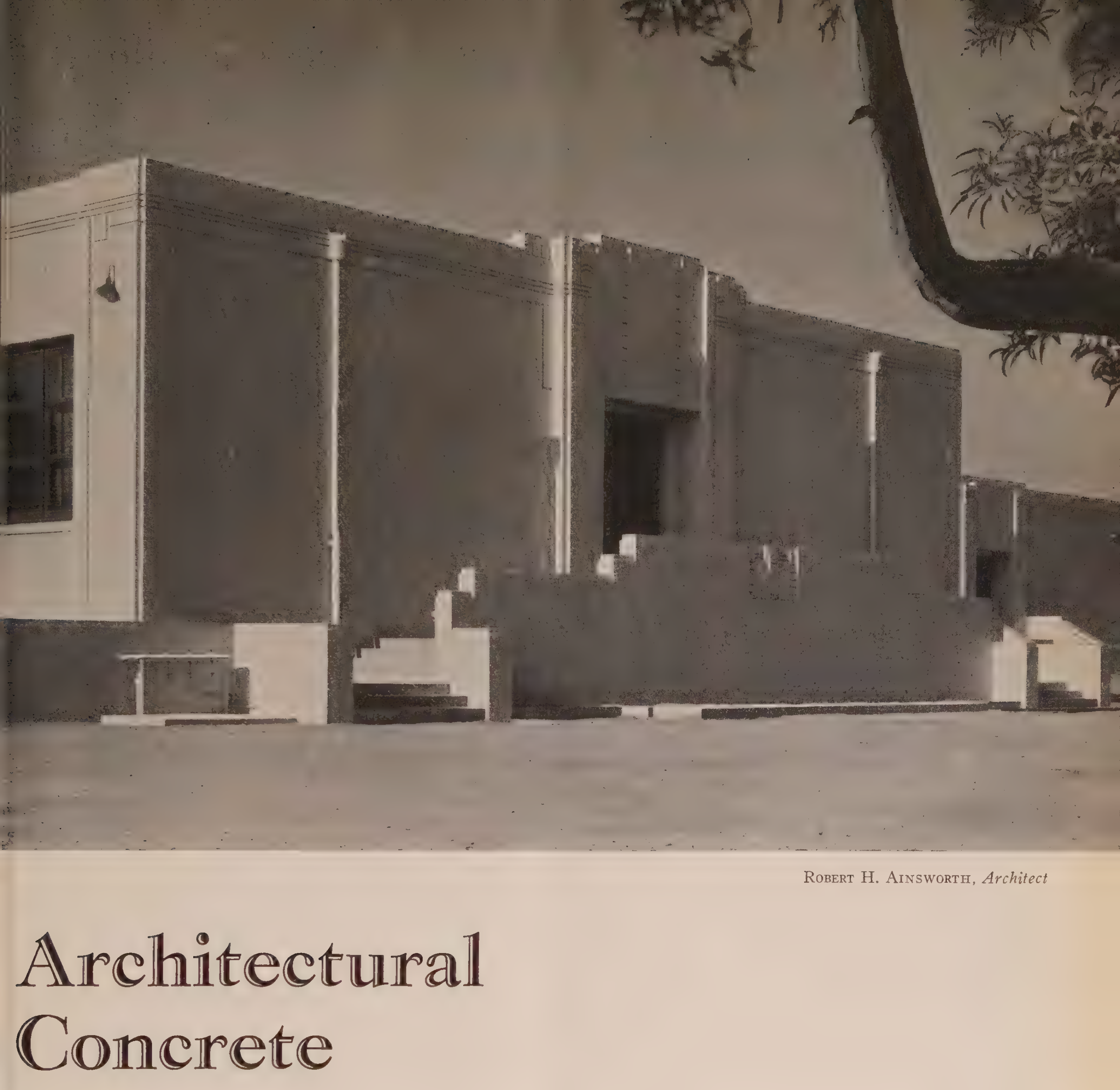
This recommendation, which was proposed by a committee of the National Association of Purchasing Agents, is limited to a color code for marking commonly-used grades of steel. The recommended color code, if approved by the industry, will be issued as a simplified practice recommendation.

General Engineering at Iowa State

FRANK D. PAINE, head and professor of general engineering, Iowa State College, Ames, Iowa, announces the expansion of the curriculum of the department of general engineering, to include those fundamental engineering, business and management subjects which will provide that training essential to progress and success in training courses for factory management, production, business operations, sales and application engineering, and for industrial departments of business concerns.

New York Building Code

THE aldermanic committee on buildings, of the New York Board of Aldermen, resumed the holding of public hearings on October 31 to consider the proposed new building code for that city. The proposed code, prepared several years ago, was sponsored by the Merchants' Association of New York.



Robert H. Ainsworth, *Architect*

Architectural Concrete

Walls of hollow monolithic concrete, with a smooth exterior finish obtained by the use of oiled plywood as lining in the form work, produced this marvelous effect. The building is the Grover Cleveland Elementary School, Pasadena, Calif. Robert H. Ainsworth, architect; William C. Crowell, contractor.

Portland-Pozzolan Cement for Bonneville Dam

Essential Properties of Separate Materials and Finished Product—Three Parts Cement Clinker to One Part of Pozzolan

DETAILED requirements for portland-pozzolan cement specified by the U. S. Engineer Office for use in the construction of Bonneville Dam on the Bonneville power-navigation project in the state of Washington will be found in specifications issued by the U. S. District Engineer of the Second Portland District, Portland, Oregon.

For the information of interested readers of CONCRETE, the essential features of the requirements are here given.

To begin with, the blend of portland cement and pozzolanic material shall be obtained by intergrinding three parts, by weight, of portland cement clinker and one part, by weight, of calcined pozzolanic material, with no additions subsequent to calcination except water and gypsum.

Requirements for Clinker

As to the chemical properties of the portland cement clinker, the magnesia (MgO) content shall not exceed 5.00 per cent; the sulfuric anhydride (SO_3) content shall not exceed 0.50 per cent; and the insoluble residue shall not exceed 0.85 per cent.

The ratio of the percentage of iron oxide (Fe_2O_3) to the percentage of aluminum oxide (Al_2O_3) shall not exceed 1.56.

The quantity of tricalcium silicate ($3CaO.SiO_2$) in the clinker is limited to 55 per cent; and the tricalcium aluminate ($3CaO.Al_2O_3$) content shall not exceed 7 per cent.

Requirements for Pozzolanic Material

Pozzolanic material is defined as a siliceous material which exhibits cementitious properties when mixed with hydrated lime. As to the chemical properties of the pozzolanic material, the following limits shall not be exceeded, as evidenced by chemical determinations on composite samples:

Item	Limit, per cent
Silica (SiO_2), not less than	50.0
Calcium oxide (CaO), not more than	10.0
Loss on ignition, not more than	3.0

The pozzolanic material shall be calcined at a temperature of about 1,500 deg. F.

Its activity when mixed with hydrated lime is determined from the average compressive strength of not less than three test cylinders of pozzolan-lime-sand mortar, mixed in the proportions, by weight, of two parts of even-dry pozzolan, one part of hydrated lime, and nine parts of standard sand. The average compressive strength of these cylinders shall be at least 500 lb. per sq. in. at the age of 7 days, and at least 800 lb. per sq. in. at the age of 28 days.

For the compressive strength test just mentioned, the pozzolan shall be of such fineness that the specific surface is 2,200 sq. cm. per gm., plus or minus 100 sq. cm. per gm. The hydrated lime shall conform to the requirements of A.S.T.M. specification C 6-31; and, in addition, the lime shall contain not less than 75 per cent of calcium oxide (CaO), and not more than 5 per cent of magnesia (MgO). Furthermore, the hydrated lime shall be of such fineness that not more than 5 per cent is retained on a 325-mesh sieve. The sand shall be standard Ottawa sand.

Requirements for Portland-Pozzolan Cement

Considering now the finished product—the blend of an intimately ground mixture of three parts (by weight) of portland cement clinker and one part (by weight) of pozzolanic material—the following requirements must be met:

Chemical properties of portland-pozzolan cement.—The following maximum limits shall not be exceeded:

Item	Maximum Limit, per cent
Loss on ignition	3.00
Sulfuric anhydride (SO_3)	2.00
Magnesia (MgO)	5.00

Fineness.—The residue of portland-pozzolan cement on a 325-mesh sieve shall not exceed 12 per cent, by weight, when the sample is sieved wet. The specific surface of the portland-pozzolan cement shall be not less than 1,800 sq. cm. per gm.

Soundness.—A pat of neat portland-pozzolan cement shall remain firm and hard, and show no signs of distortion, cracking, checking, or disintegration in the steam test for soundness. A slab of neat portland-pozzolan cement shall show no signs of cracking, checking, or disintegration when exposed for 28 days to the sodium-sulfate test for soundness.

Time of setting.—The portland-pozzolan cement shall not develop initial set in less than 60 minutes as determined by the Gillmore needle. Final set shall be attained within 10 hours.

Tensile strength.—The average tensile strength (in lb. per sq. in.) of not less than three standard mortar briquets containing one part of portland-pozzolan cement to three parts of standard sand, by weight, shall be equal to, or higher than, the following:

Age at test, days	Storage of briquets at 70 ± 3° F.	Tensile Strength, lb. per sq. in.
7	1 day in moist room, 6 days under water or in fog	275
28	1 day in moist room, 27 days under water or in fog	350

The average tensile strength of the standard mortar at the age of 28 days shall be higher than at 7 days.

The foregoing requirements are of special interest because, in condensed form, they disclose what the government engineers regard as the essential chemical and physical properties of portland-pozzolan blended cements suitable for structures such as large dams. And, in addition, the required properties of the separate materials are set forth, as well as those of the finished product.

Prof. *Lowell O. Stewart* has been appointed personnel officer for the division of engineering of Iowa State College of Agriculture and Mechanic Arts, Ames, Iowa, and will supervise all personnel work in this division. Prof. Stewart recently has been associate professor of civil engineering at Iowa State College and one of the junior college counselors on the personnel staff. Prof. Stewart received the degree of bachelor of science in civil engineering from Michigan State College in 1917, his master of science from Iowa State College in 1927 and his professional degree in 1928.

Concrete Sidewalks Ideal for Work Relief

ELEVEN Massachusetts cities alone are scheduled to place a total of 76 miles of concrete sidewalks in the late summer and fall months of 1935.

This activity is one result of the successful plan introduced by Newburyport, Mass., in 1934, when the city built a large yardage of sidewalks with relief labor. Property owners who came in on the plan were required only to buy the cement. The city supplied the sand and gravel, and the necessary trucking. When the full details of the plan were announced in local newspapers, the city was swamped with requests from property owners.

Property owners favor construction of concrete sidewalks as relief work, on basis of plan started in Massachusetts

Neighboring cities, learning of the success of the plan, have instituted similar offers to property owners, with the result that huge sidewalk construction programs have been prepared. Variations from the Newburyport plan have been introduced in some of the cities. For instance, in several cities the property owners are required to pay for the aggregates as well as the cement. In others, street reconstruction is included, along with sidewalks, in the program.

Other instances of sidewalk construction on a large scale come from various parts of the country. Grove City, Penna., has built more than 30,000 sq. ft. of concrete sidewalks this year. In Waco, Texas, property owners have signed up for 200,000 sq. ft. under an arrangement similar to the one employed at Newburyport. And, in addition, the demand for sidewalks along concrete highways again is heard.

Unquestionably the concrete sidewalk is playing an important part in relief work.

J. B. Wilkinson, chief engineer of the Fire Insurance Rating Bureau, Milwaukee, Wis., has been appointed a member of the Electrical Council of Underwriters' Laboratories, Chicago. This fills the vacancy caused by the death, last February, of Frank R. Daniel.

Two House Competitions

Cash Prizes Offered in National Contest, and in Texas

A CASH prize of $1,250 will be the major award in a new-home competition inaugurated by the magazine *Better Homes and Gardens*, published by the Meredith Publishing Company, Des Moines, Iowa.

The competition covers homes built during 1935 and completed by the end of the present year.

Information regarding this competition may be found in recent issues of *Better Homes and Gardens*, in which entry blanks will also be found.

An interesting feature of the contest is the provision that a special bonus of 25 per cent of any award will be paid to the architect who designed the home winning that ward. In this way, recognition will be given to the part played by the man who is often forgotten.

Architectural Concrete House Competition in Texas

A contest for the best design of a firesafe concrete house, to cost not more than $4,500 is being conducted by the Portland Cement Association in Texas. Only Texas architects and engineers may compete.

The first prize is $1,000, second prize $500, third award $250. There are eleven prizes in all, for a total of $2,350.

Competition rules require that the house shall contain not less than two bedrooms and be of a character appropriate for a lot 60 ft. wide and 150 ft. deep, in a typical Texas suburb. Plans will be judged from the standing of architectural design, comfort, convenience of living, economical arrangement of floor areas and the intelligent and economical use of portland cement products in the construction and finish.

The sponsors propose to select one of the designs submitted and erect a model house in Exposition Park, Dallas, as a feature of the Texas Centennial Central Exposition.

Because convenience and livability will be among the important points considered in the Texas house competition, a domestic science expert will be among the judges. Ralph Bryan, architect, is acting as architectural adviser.

Brookmire Is Optimistic

BROOKMIRE Business Index in August was within two points of the year's high. Preliminary figures for September shows the index at the August level. Decline in automobile output preparatory to the introduction of new models was offset by rises in all other components of the index. The boom in business is upon us, and we expect substantial improvement from these levels.—*Brookmire Report.*

Loans Up to $50,000

Sell Modernizing Idea to Owner Through Separate Analysis of Each Property

A NEW 24-page illustrated book just published by the Federal Housing Administration under the title of *Loans Up to* $50,000 (and the serial designation of FHA-180) explains how responsible business men may obtain modernization credit in any amount up to $50,000 for the improvement or re-equipment of a wide variety of mercantile and industrial buildings.

Properties Eligible for Loans

No one class of property has a monopoly on these insured loans. The following kinds of property are specifically named as among those eligible:

Apartment houses
Multiple family dwellings (two or more separate dwelling units under the same roof)
Hotels
Office buildings
Retail stores (all types)
Arcades
Restaurants
Barber and beauty shops
Commercial airports
Schools and colleges
Hospitals and orphanages
Dairies
Laundries
Storage warehouses
Garages and repair shops
Machine shops
Rolling mills
Foundries
Manufacturing plants (large or small)
Brickyards and lumberyards
Sawmills
Mines, sand and gravel plants, stone quarries

Merchants, manufacturers, property owners, and business men generally—executives and others interested in institutional properties—may, through these government-insured loans, plan comprehensive modernization and improvement programs and finance them in the most practical manner through bank loans that are repaid monthly over a period of from one to five years.

Study Each Property

Concrete contractors and manufacturers of concrete products, acting in co-operation with architects and industrial engineers, may reap the benefit of this government-insured arrangement by concentrating on individual properties where the advantages of modernization are most clearly evident.

Certain principles of good salesmanship must be followed to bring these individual properties to the point of actual contracts; and yet every business man knows the value of modernization.

Owners Know Value

Owners of retail stores, in particular, know that customers walk past a place that presents a shabby or uninteresting front. Manufacturers, likewise, know the value of the kind of modernization—especially of equipment—that reduces operating costs and cuts expenses for maintenance.

After all, the sales problem for the architect, the engineer, the products manufacturer or the contractor is mainly one of analyzing each property separately and presenting the specific advantages to be gained through modernization.

Good Sales Aid

The book entitled *Loans Up to* $50,000 is in itself an excellent sales aid. There are some extremely interesting illustrations, reproduced from actual photographs, showing a number of before-and-after views. These pictures show complete transformations from dull and uninteresting old buildings, devoid of architectural treatment, to modernized and colorful structures that conform to the ideas of 1935.

While the supply lasts, copies of the book *Loans Up to* $50,000 may be obtained without charge, either by writing to CONCRETE or by writing direct to the Federal Housing Administration, Washington, D. C.

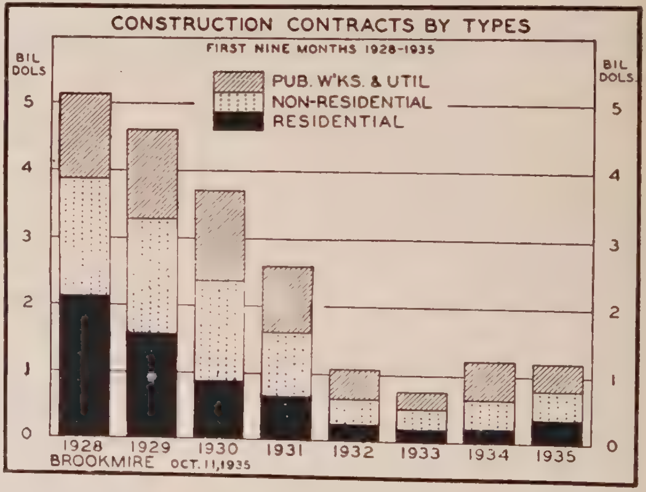
Building Outlook Bright

(*From Brookmire Report, Oct.* 11, 1935)

CONSTRUCTION contracts awarded in the first nine months of 1935 in relation to last year show losses in public works and utilities, losses in other types, excepting residential, but a substantial gain in residential types.

There has been a considerable improvement in the public works awards since the middle of the year, but the nine months' figures were 27 per cent smaller than a year ago. It is possible that the deficiency may more than be made up before the year-end, but we can no longer get excited about a business boom being created by public works.

Residential awards in the nine months, though only 28 per cent of the total, were 80 per cent higher than in similar months of 1934. In 1936, the proportion of residential awards in the total should be considerable higher.



In spite of the large percentage gain in residential awards, the figures for 1935 are only 16 per cent of those in 1928. We believe residential building will continue to move ahead for several years, perhaps culminating at a level even above that of 1928.

There is evidence to indicate that more business will be done along the lines of plant expansion and renovation. This type of construction seems likely to increase in the coming year.

The Concrete Products Manufacturer

Association Activities + + + News of the Industry

HOME-BUILDING BOOM at Washington

Philadelphia and Detroit Areas Also Busy—Many Products Plants Working Under Pressure—Convention Plans Completed

By D. R. COLLINS
Assistant Secretary, National Concrete Masonry Association
33 W. Grand Ave., Chicago

PROBABLY every man in the concrete products business has dreamed, at one time or another, of the day when business would be so good that his customers would pay for jobs in advance in order to have the privilege of using his block. Exactly that thing has happened in at least one city in the United States this year—and it was no dream.

Big Home-Building Boom

So great has been the home-building boom in and around Washington, D. C., this past year, and so great has been the shortage of concrete masonry units, that many contractors have found that they could get immediate delivery only by driving to the local block plant with their own trucks, paying for the job in advance, and carting the block away themselves.

Washington has experienced a house-building boom that is even greater than in the so-called "good old days." Authorities estimate that some 3,500 homes have been built in this vicinity so far this year. Block plants are running night and day. Units are being shipped into Washington from as far north as Allentown, Pa. Richmond and Norfolk, Va., also have contributed their share of units to this market. Philadelphia and Baltimore are supplying many units in this territory.

Result of Long Effort

All of this is because capacities of local plants are such that they can not supply the demand for their product. But this business, like Topsy, has not just "growed up." It is the result of a careful sales campaign which has been going on in the Washington area over a long period of years. Probably some of the most highly skilled concrete masonry salesmen in the United States have developed this tremendous market during the lean years from 1929 to 1934. These men were continually on the job, calling on contractors, builders, architects, extolling the virtues of their units and seeing to it that whenever jobs came up, concrete masonry was always in the specifications. As a result of this sales work. the situation related above has been built. I happen to know a good many of these men personally, and have had the pleasure of working with them during the so-called "lean" years, and know that at no time did they let their enthusiasm diminish, nor did they fail to put everything on the ball that it takes to build up a market.

Concrete Masonry News Letter

These salesmen, in this work of market building, did not simply follow jobs—they used to good advantage the Association's book *Facts About Concrete Masonry*. They devised new ways of building walls—they saw to it that their building code provided for these new types of construction that they developed. They told their story over and over again, even though there were no jobs on the boards; and today they are reaping the harvest.

Concentrate on Ashlar

The situation in Washington is rather an exaggerated one at the present time, but in my contacts during the past month I found that wherever, through aggressive sales work, products manufacturers have built a demand for their material, they are doing a business today far ahead of 1934. It is satisfying to note that much of this business is above grade, that they are not confining their activities to basements alone. This is the *real* market for concrete masonry—the one in which volume and profits lie.

Home building continues to be predominant in the construction field, and sales for this purpose in October are again far ahead of the same month last year. The mortgage market continues to ease, and from what I could learn at Washington there will be a tremendous amount of money available for home mortgages next year—far more than is available at the present time.

In the Philadelphia area a group of manufacturers got together last spring with the idea of selling more ashlar houses. They retained an advertising agency, outlined a real sales campaign, and as a result, at the present time have prospects for some 27 low-cost concrete ashlar homes. They expect to have orders on their books for a hundred of such homes before spring breaks the building season into full swing again.

Getting a Prospect List

These manufacturers are using one clever stunt that might well be utilized by many others. They get from the tax assessor's office a list of all vacant properties on which taxes have been kept up during the past four years. Then they contact the owners of these properties with the idea of selling them a low-cost concrete ashlar home, which may either be sold by the property owner, lived in by him, or rented. They have had a local architect draw up detailed plans of several small homes in the $3,500 to $5,000 class. They have had local con-

Detroit Convention Speakers and Attractions

THE DETROIT CONVENTION of the National Concrete Masonry Association and the National Cinder Concrete Products Association will devote only a part of the first day of its 3-day sessions to papers, talks and floor discussions; but for this one session, three first-string speakers have been selected.

Arthur K. Hyde, a well-known Detroit architect, designer of the Tower Theatre and numerous other public buildings in which he made use of concrete ashlar for interior finish and exterior walls, will be one.

Ralph W. Straight, of Bennett and Straight, architects, Dearborn, Michigan, is another of the trio. Notable among his creations is the Dearborn Theatre, and many other buildings in which he has made liberal use of concrete ashlar and colored cement paints.

Albert E. Bill, an active Detroit home builder, is the third of the three speakers. Thus far in 1935 he has built eight or ten 6-room homes in the $5,200 class, modified colonial style, with exterior walls of cinder concrete units coated with white cement paint.

The remaining two days of the convention will be taken up with inspection trips and observation of new products machinery and equipment at Detroit products manufacturing plants. This part of the convention schedule was given on page 22 of the October issue of "Concrete," and will be given in detail later.

A project not specifically named in the convention schedule, but which should be visited by all, is the Oakland County (Michigan) subsistence homestead project sponsored by United States Senator Couzens. The location is in the midst of the lake district nine miles west of Pontiac, and about 30 miles from downtown Detroit.

Hundreds of thousands of concrete masonry building units are being utilized in the first-story walls of the 150 homes included in this project. One large Detroit products plant is supplying the units for 50 of the houses.

These subsistence homesteads will be sold to qualified applicants at a cost of $18 a month, over a period of 20 to 30 years. Each house will have an attached garage and about one acre of ground. Construction work will be well advanced by the time of the Detroit convention.

Arrangement of the convention program is in the hands of a joint committee, with Harry H. Longenecker and Einar Christensen representing the National Cinder Concrete Products Association, and Benjamin Wilk and D. R. Collins representing the National Concrete Masonry Association.

tractors figure these plans so that when they talk to a prospective customer they are able to lay a blueprint on his desk and state in no uncertain manner, "This home can be built on your lot for $3,972." They have secured FHA approval on the homes, so that they can tell the prospective customer that FHA will issue a commitment for insurance and they can tell the prospective customer exactly what the home is going to cost him every month.

Modern Homes Make Sales

One of the features of their campaign is an attractively printed card which reads:

> **Do you earn $20 a week or more? The Government will help you build a house like this. . . . Let us show you how.**

As this is being written, these manufacturers are climaxing their advertising campaign with a beautiful exhibit of a concrete ashlar house at the Philadelphia Food Show. During the first five days of the exposition, more than 18,000 people passed through this house. The manufacturers who sponsored it have been in attendance all the time and feel that they have developed an excellent prospect list for houses of this type. They plan an aggressive follow-up on the basis of the names they have secured. The house was designed by a local architect, F. B. Kolle, and has the joint sponsorship of the Philadelphia Real Estate Board and the Federal Housing Administration.

Speaking of model homes, the sooner products manufacturers realize that the real way to sell concrete houses is to visualize them, the sooner they will be able to expand their markets. This year some 82 concrete masonry demonstration houses have been built in various parts of the country. While it is impossible to estimate how many houses have been sold as a result of these demonstrations, we do know of several cases where 4 or 5 and even 12 homes of the same type have resulted from the demonstrations. The old Chinese adage that a picture is worth 10,000 words, has been conclusively proved by these demonstrations, and results in most cases have exceeded the fondest hopes of their sponsors.

Convention Plans

Plans for the 1936 convention are going ahead at a fast pace. Only three formal speakers will be on the program. The rest of the 3-day session will be given over to informal discussions and demonstrations. The Detroit committee, composed of W. D. Kimmel, Benjamin Wilk, Herb Vincent and Harry H. Warsaw, are doing a remarkable job. Practically all of the final details are now completed. Manufacturers of concrete masonry are assured of the finest, most constructive meeting that ever has been held in the history of the industry.

I have been out in the field during the past month, and everywhere I find manufacturers talking about this new type of convention, commenting on the fact that it is the most constructive move the Association has ever made, and planning to be in attendance. I have been planning conventions for the last 15 years, but I have never known one that has caught the public fancy as much as this one; has caused as much comment three months in advance of the actual meeting date. Nor have I ever had so many people tell me this far in advance that they have already started building up a little fund so they might be in attendance. It promises to be the biggest convention the industry has ever had.

If the readers of CONCRETE did not get the details from the last issue, they should go over them carefully today and then make plans to be in attendance.

Most men that I have talked to feel that we are starting a new era in the concrete products business and that a convention such as we intend to hold in Detroit, January 21, 22 and 23, can well be the starting point toward this new goal.

News of the Products Industry

Place Concrete Mats Along the Mississippi

CONCRETE blocks, shaped like pyramids and joined together by wire to make a mat of any dimension are sunk along the banks of the Mississippi River in the bends of the river to stop the current from washing the banks away. If allowed to meander in its own way, the river would cut into the levees and become so crooked that it would be greatly impeded, making either artificial or natural cut-off necessary.

The laying of these mats along the Mississippi river bank, beginning at Arkansas City and proceeding south will give employment to 1,200 men, it is expected. Engineers and employees of the Mississippi River Commission were making preparations late in September to house 550 men employed on the concrete sinking boat. The equipment of the mat sinking unit totals 12 crafts.

The concrete blocks for the sinking patrol will be manufactured in Greenville, Mississippi, where it is expected 460 additional workers will be given employment in making the blocks that comprise the mats. The Greenville casting plant has been idle for the past eight months. The payroll at Greenville is estimated at $90,000.

Sanitary Toilets in Rural Areas—Owners to Furnish Materials

A COMMUNITY sanitation project is to be inaugurated soon by WPA and the United States Public Health Service entailing construction of 2,227 sanitary toilets in rural areas of Mahoning County, Ohio, involving expenditure of $39,422 in federal funds and providing 71,822 man-hours of relief labor, says the Youngstown, Ohio, *Vindicator.*

Part of a $4,000,000 state-wide program, the project will provide sanitary toilets for farmers and others living in areas without adequate sewage disposal facilities, for the cost of materials only, all labor being provided by the government.

All work will be in accordance with plans and specifications provided and approved by U. S. and state health authorities. Harry Van Wagner has been appointed district supervisor over eight counties, including Mahoning County.

While the project will be handled and controlled by the Works Progress Administration in the same manner as all other types of work, the actual work will be conducted under the technical supervision of the U. S. Public Health Service.

The federal government will supply all labor and the farmer will be charged only the cost of materials, estimated now at about $16, while the labor cost will be $18.

The WPA will dig a 4½-ft. hole, install the concrete floor and riser, with concrete sills to prevent rotting, and set up the wooden house.

The concrete floor will be cast in a concrete products plant and will be delivered by truck. The house also will be constructed in a shop and delivered in sections.

Raze Block Building Erected in 1872

THE Syracuse (N. Y.) *Post-Standard* describes the recent razing of the Aldrich Block, in that city, built in 1872 in South Salina St. nearly opposite Tallman St. Originally the building was known as Newell Place, having been built by Justus Newell, who died in 1885.

Much building material was salvaged during the wrecking operations; and a large part of the material thus reclaimed consisted of concrete building blocks in excellent condition. The front of the building was faced with clay brick.

While no claim is made that this represents the earliest use of concrete building block in this country, it is probably one of the earliest cases on record. It is known also that Justus Newell, who owned considerable property in Syracuse, built several other buildings of concrete blocks after the erection of Newell Place.

Concrete Paving Blocks

THE Municipal Council of Gloucester, Massachusetts, voted recently to construct the square formed by the intersection of Main, Washington, Commercial and Rogers Streets with the new type of concrete and granite paving block being manufactured at Lanesville under an ERA project. Henry H. Parsons is superintendent of streets.

Build Applesauce Plant

A GROUP of four buildings mostly of concrete block construction, has been erected and equipped with modern machinery for the production of applesauce as a commercial commodity at Chambersburg, Pa., by The Lum Packing Company, Inc. Between $35,000 and $40,000 has been invested in the enterprise.

The buildings were erected by Quigley Hafer, local contractor.

A CONCRETE silo, 14x40 ft., with a 150-ton capacity, has been built by William Hunt for Rollo Hults on his farm north of Sterling, Illinois.

PERSONAL

William Elsworth Craiglow, 62 years old, partner of Ralph E. Cowan of the United Cement Products Company, 1335 Mosley Avenue, Wichita, Kansas, died recently after an illness of six months.

Thomas Andrew Click, 77, president of the Click Burial Vault Co. of New Philadelphia, Ohio, and one of its founders, died on October 4. Mr. Click was engaged in manufacturing concrete products for 40 years.

Pressure Concrete Construction, Inc., 35 E. Wacker Drive, Chicago, has been incorporated with 300 shares p. v. preferred and 700 shares p. v. common stock, to conduct a general contracting and construction business. Incorporators are Charles O. Rundell, R. T. Savage and E. R. Johnson.

T. H. Sutch, Willoughby, Ohio, has been manufacturing concrete building and chimney blocks for the past thirty years.

Thousands of blocks manufactured in his Elm Street plant can now be found in homes in Willoughby and the surrounding country. The plant was established in 1915.

Charles J. Hartley of the Elmhurst-Chicago Stone Company was elected president of the Northeast Illinois Concrete Masonry Association at a meeting of that organization held early in September in the Builders' Building, Chicago. The group was organized some time ago, and has as its object the raising of standards in the concrete masonry industry.

CONCRETE MERCHANDISING Keeps Small Plant Busy

Produces Concrete Brick, Precast Joists, Milk-Cooling Tanks, Cribbing Units, Ready-Mixed Concrete—Has Payroll of Twenty Men

By CALVIN S. GODDARD
Portland Cement Association, 347 Madison Ave., New York, N. Y.

CONCRETE MERCHANDISING is the only solution to the job-hunting problem, is the claim of Don S. Moulton, of Morrisville, Vermont. His slogan, "Make It of Concrete," keeps him busy the whole year round. His only complaint is that his office work interferes too much with his daily program.

In a region where lumber is plentiful and competition is keen, it is necessary, in order to sell concrete, first to sell ideas—and those ideas must be original. How well Moulton has succeeded may be judged when one considers that in a town of only 2,000 population his organization has averaged more than 20 men on its payroll during the past two years. In this same period of two years he has made and sold 180,000 concrete bricks, 24,000 concrete blocks, 210 insulated concrete milk-cooling tanks, 1,500 concrete crib-units, 2,500 lin. ft. of precast reinforced concrete joists, and other concrete products in various quantities.

Those Milk-Cooling Tanks

It was Moulton's ability to hatch out original ideas that led directly to the development of his cork-insulated precast concrete milk-cooling tanks.

Of two, four, six, eight, ten or twelve-can capacity, Moulton builds these milk-cooling tanks, in his shop, delivers and sets them at a price lower than competing makes. The thin concrete walls are of vibrated concrete. Two tanks are made, simultaneously, in a well built, specially designed, metal form. More than a hundred were sold last year; still more will be sold this year. One method of selling tanks which has proved very successful, is by exhibition at the one-day country fairs. Moulton sends two men with two tanks and orders "Don't bring them back." So they sell the tanks, deliver them and return, late at night, with an empty truck, a pocket full of money, and usually with orders for two or three more tanks.

Everything in Concrete

Milk production is a major industry of northern Vermont—the United Farmer's Co-operative Association has established a creamery and milk depot at Morrisville. The efficiency of such a plant, when built of concrete, is demonstrated here, thanks to Moulton's activity. He has sold them freight yard paving—700 sq. yd.—loading platforms, concrete steps, concrete bricks, an extensive concrete crib retaining wall of his own design and manufacture; and last but not least, a new addition of reinforced concrete to their building, which includes a floor supported by 10-in. reinforced precast joists, about 175 sq. yd. in floor area.

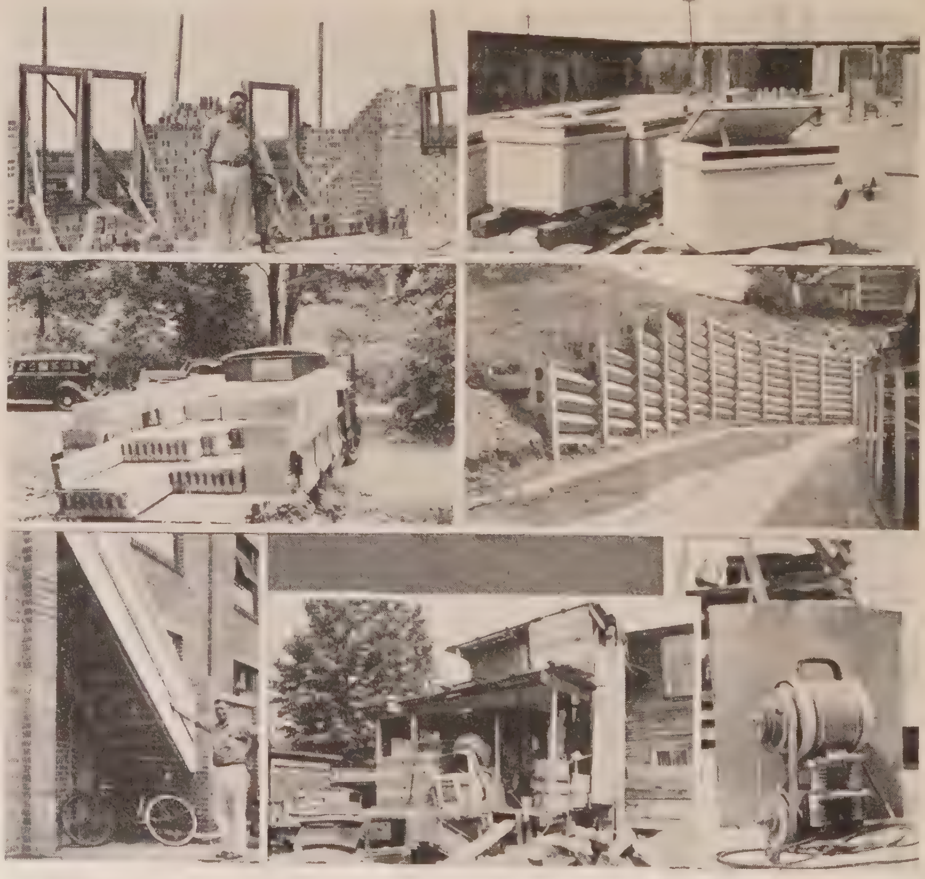
He invented and manufactured his own vibrator — an eccentric shaft running in oil, rotated by a $\frac{1}{2}$-h.p. high-speed motor. It is a portable equipment which he uses on all precast products.

The town "fathers" needed a bullet-proof building for storage of dynamite. Moulton built it, with precast, interlocking slabs, rabbeted concrete door, provided with a sturdy lock.

The town highway department paved a street with cement-bound macadam. Although he didn't get the job, he spent a lot of time on it, watching and learning, getting the new ideas, something to be used in the future.

Septic Tanks to Be Added

He is now planning to build precast



A diversity of concrete products is manufactured at Donald S. Moulton's plant—the Vermont Duntile Co.—at Morrisville, Vermont. Upper left: Residence construction of concrete brick. Upper right: Precast milk-cooling tanks. Middle, left: Truck-load of precast reinforced concrete floor joists. Middle, right: Retaining wall of precast concrete cribbing. Lower left: More concrete brick and reinforced concrete stair construction. Lower, center: Small ready-mixed concrete plant. Lower right: High-frequency vibrator, designed and manufactured by Moulton concrete septic tanks—another recognition that the old order of things must go. The septic tanks cost more, but he thinks they're worth it, and he also thinks he can build up a market for them. By employing vibration, he expects to keep the cost down to what the people can afford to pay—that's his sales philosophy.

Moulton has made his business so good that he is now building a house—for his own occupancy—all concrete, with 8-in. precast concrete joist floors. Walls are of his own concrete brick, three sizes laid up in random ashlar style—something new and different for the town of Morrisville; but it will sell more houses that will require more concrete bricks and more precast concrete floor joists.

As if all this were not enough for one organization—the Vermont Duntile Company—Moulton also operates a small ready-mixed concrete plant, an establishment that consists of the essential bins and mechanical equipment with a shed built over them.

Increases Concrete Facilities

Pioneer Concern Improves Its Equipment with 100-Ton Bin, Batcher, Mixers

MAULE-Ojus Rock Company, pioneer concern in the concrete and general building supply field, with plant and wharfage at 1730 Purdy Avenue, Miami Beach, Florida, announces the completion of a new bin and batcher.

The company also purchased six Blaw-Knox truck mixers, representing the latest advances in the mixing and delivering of certified concrete to the site of the job. The mixers, mounted on special Ford V-8 chasses, take the concrete from the batcher. The mixer drums are charged with the concrete in an average of three minutes' time, and the contents are revolved in the mixer units on the way to the site, where it is dumped into the forms.

The new bin at the Maule-Ojus Miami Beach plant is a two-compartment, 100-tone size and the 1½-cu. yd. batcher is of the latest type. The plant has a capacity for 250 cu. yd. daily, sufficient for the largest projects in the area.

The Maule-Ojus Rock Company was established at Ojus, Fla., 22 years ago by E. P. Maule, and has during that period become known as one of the largest producers of rock, sand, cement and concrete blocks in the country. Ojus rock is known to contractors everywhere. The company has supplied rock and other materials for all the cities and counties along the east coast of Florida. A stock of more than 150,000 concrete blocks is maintained at all times and none are delivered until after they have been cured for 28 days. Ballast for the Florida East Coast Railroad has been furnished for more than 20 years.

The property of the Maule-Ojus Rock Company at Ojus comprises 440 acres and extends for three-fourths of a mile along either side of the Federal highway. The company operates several miles of railway in connection with its quarry work. During the boom days in Miami as high as 90 freight carloads of rock were produced daily.

At the present time the company utilizes a fleet of 40 trucks, including the six new Blaw-Knox mixer trucks. An average of approximately 300 men are employed at the Ojus quarries and in the concrete block plants, said to be the largest known. From 75 to 80 men are employed at the Miami Beach plant, warehouses and offices.

Included in the products of the Maule-Ojus Company are rock, sand, concrete bricks and blocks, asphalt mixtures, flower pots, garden furniture and drain tile.

M. C. E. Burgoon, civil engineer, is in charge of the engineering work for the Maule-Ojus Rock Company. Mr. Burgoon, who has had several years' experience in the ready-mixed concrete industry, also will have supervision of the new bin and batcher plant at the Miami Beach headquarters.

A recently added department at the plant is a shop for fabricating reinforcing steel. The company is supplying all the steel, rock and cement being used in the construction of the larger hotels and apartment houses in Miami Beach. V. T. Bornet is engineer in charge of the steel fabrication work.

C. H. How is superintendent of the Maule-Ojus Rock Company's main plant at Ojus.

Shift Miles of Highway Slab

Move 500 Ft. at a Time by Inflating Hose—Experiment Proves Plan Is Practicable

A 35-TON concrete roadway slab, 14½ ft. wide and 35 ft. long, forming a section of the Brunswick road near Trenton, N. J., has been shifted 12 ft. by means of compressed air to permit the installation of a safety island in the middle of the right-of-way, says the Newark (N. J.) *News.*

The experiment, which was observed by a number of visiting highway engineers, is believed to be without precedent. The work was done by the maintenance department forces of the state highway department.

Sigvald Johanesson, highway department engineer, devised part of the equipment necessary to remove the slab.

A plow-like blade, drawn by a steam roller, first removed the bituminous material that sealed the concrete joints. Into the half-inch opening thus made, a flattened piece of regulation fire hose 2½ in. in diameter was inserted, and when the hose was filled with compressed air at a pressure of 25 lb. it moved the slab 1½ in.

A hose 6 in. in diameter then moved the slab 4 in. each time it was inflated at a similar pressure, heavy timbers having been placed in the gap to provide a backing.

This operation was in the nature of an experiment to determine the practicability of similarly shifting an 8-mile stretch of slab. In this main operation it is planned to shift a 500-ft. stretch of slab at a time, by means of a hose 500 ft. long.

HOW TO DO IT

✦ Questions and Answers ✦
Consultation and Comment

A department devoted to the solution of problems encountered in concrete work. Readers are welcome to add to or improve upon the suggestions printed and to submit their views for possible publication.

Air Bubbles and Steel Forms

In constructing a flat-slab building in which steel forms are used for the circular columns, numerous small air bubbles clinging to the face of the forms leave small, round pits in the surface when the forms are removed.

We do not see that there is any harm in them, but the architect objects to them. Can you tell us what causes these bubbles and how to prevent the formation of these pitted surfaces?—A. B. S., Georgia.

This complaint comes up frequently in the case of steel forms employed in the round columns and column heads of flat slab building construction, and similar complaints sometimes arise from the use of metal forms in products manufacture. The effect of these air bubbles is that when the forms are removed the surface is found to be pitted with small pockets of the size of peas or thereabouts.

The formation of these bubbles where steel forms are used is especially prevalent where the surface is vertical, as in the case of the circular reinforced concrete columns you describe. The presence of the surface bubbles and the consequent formation of small pits is due to the fact that when the concrete is puddled or vibrated into place, air bubbles are driven to the face of the vertical sides. In the case of wooden forms, there is usually an opportunity for the air in these bubbles to escape through cracks in the form work; but with steel forms no such escape is possible. In consequence, the bubbles remain trapped next to the face of the steel forms, with the result that a small pocket or pit appears when the forms are removed.

Spading with a flat tool along the forms will reduce the number of these bubbles, but it is not likely to remove all of them, unless the vertical rate of placing the concrete is quite slow, so that the continuous spading with the flat tool referred to can give the air an opportunity to escape.

Formation of bubbles is also more prevalent with relatively dry concrete than with a more slushy mixture.

From the foregoing, it appears that the most effective way of preventing the formation of an excessive number of bubbles, in cases such as circular reinforced concrete columns, is to avoid too rapid placing of the concrete, and to keep up a continuous spading with a flat tool along the forms while the concrete is being placed. This spading should be applied even if the concrete is being placed under high-frequency vibration.

It is worth mentioning that the presence of these surface pits often improves the texture of cast concrete units, especially those intended for interior finish of the travertine type.

Cost Accounting for Products Plants

Can you refer me to any good books or magazine articles on cost accounting in connection with the operation of a concrete products plant?—A. L., Minnesota.

The magazine CONCRETE has published several series of articles on cost accounting as applied to the operation of a concrete products manufacturing plant. The first of these was a series of four articles, by F. W. Schnoebelen, printed under the heading of *Painless Bookkeeping for Products Plants* in the issues of September, October, November, and December, 1928.

Another series of articles, published throughout 1931, was written by Fred A. Sager under the heading of *Profitable Manufacture of Concrete Building Units.* The installment appearing in the issue of December, 1931, covers the subject of cost accounting.

If you would like to get into touch with either Mr. Schnoebelen or Mr. Sager, for the possible purpose of engaging one of them to install a cost-accounting system for your plant, we shall be glad to supply you their addresses.

You are referred also to a very good book entitled *Making Precast Concrete for Profit*, by A. E. Wynn, in which the author develops an accounting system for keeping costs and determining profits. The system described is simple and easily understood, and can be used by anyone not having a technical knowledge of bookkeeping. The book may be obtained from the Book Department of CONCRETE, 400 West Madison Street, Chicago, at $1.75 a copy; or, it may be obtained with a year's subscription to the magazine CONCRETE for a total of $3.25.

Literature on Ready-Mixed Concrete

Are there any books available on the subject of ready-mixed concrete? I am referring to books devoted entirely to this subject, and dealing with plant layout and design, plant operation, delivery of concrete, and so on.—R. M. A., Wyoming.

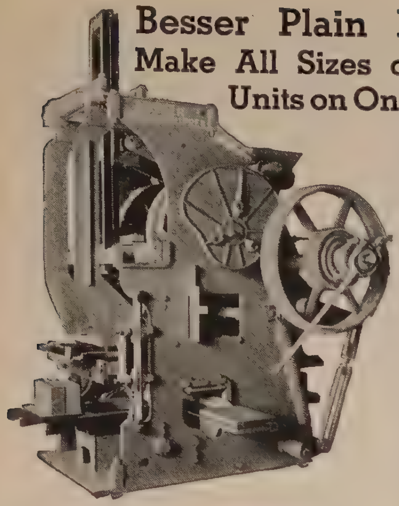
In a number of back issues of CONCRETE you will find articles on the various phases of the ready-mixed concrete industry mentioned in your letter. You are referred also to a list of pamphlets and mimeographs issued by the National Ready-Mixed Concrete Association, the titles of which appear on page 18 of the April (1933) issue of CONCRETE.

This association, working in co-operation with the National Sand and Gravel Association, has also compiled a comprehensive bibliography on ready-mixed concrete, listing articles published during the period from 1911 to 1933. A supplement to that bibliography has just been completed, covering articles published since 1933. Copies of the original bibliography and of the supplement are available for distribution. Requests for copies should be addressed to the National Ready-Mixed Concrete Association, 545 Munsey Bldg., Washington, D. C.

List of American Standards

Where can I get a list of standards adopted by the American Standards Association?—E. M. F., Alabama.

Such a list may be obtained from the American Standards Association, 29 W. 39th Street, New York. The standards are listed by title only, separated into groups; and there is also an alphabetical subject index.



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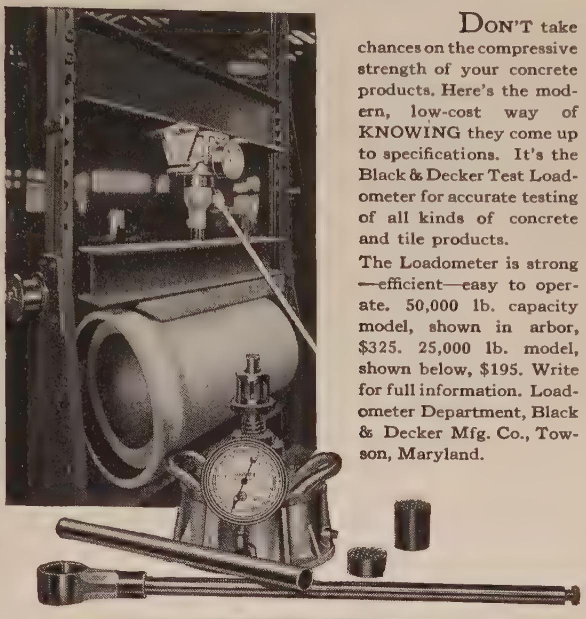

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The Loadometer is strong—efficient—easy to operate. 50,000 lb. capacity model, shown in arbor, $325. 25,000 lb. model, shown below, $195. Write for full information. Loadometer Department, Black & Decker Mfg. Co., Towson, Maryland.

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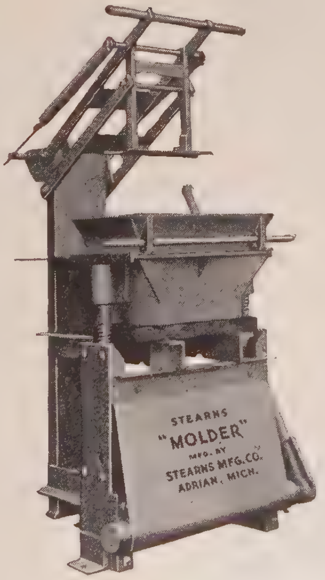

It will make manhole cone (or "batter") blocks like nobody's business! Cast one-piece mold box insures blocks the right shape and size.

It will make vertical barrel blocks for manholes—and single brick, double brick, header brick, coal briquettes, conduit separators, curb markers—a lot of salable products. A simple change of mold box and tamper head is all that's required.

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New Books and Pamphlets

Summary of Concrete Road Specifications

CHARTED SUMMARY OF CONCRETE ROAD SPECIFICATIONS is the title of an 8-page printed folder issued by the Portland Cement Association, 33 W. Grand Ave., Chicago, Ill.

This chart contains a complete tabulation of the requirements of the highway specifications of the 48 states and the District of Columbia, together with the slab cross-sections of a number of states. The information given includes the requirements for fine and coarse aggregates, the use of bulk cement and ready-mixed concrete, limiting values for modulus of rupture, compressive strength, water content, cement content, slump, and provisions for the use of reinforcement, for joints, for curing, and numerous other requirements.

Highway engineers not having copies of this summary may obtain one, either by writing to CONCRETE, or to the Portland Cement Association, 33 W. Grand Ave., Chicago.

Slums and Blighted Areas

SLUMS AND BLIGHTED AREAS IN THE UNITED STATES, by Dr. Edith E. Wood. Published by the Housing Division of the Federal Emergency Administration of Public Works, Washington, D. C., as *Housing Division Bulletin No. 1.* Paper binding, 126 pages, 6 by 9 in., extensively illustrated.

The book sets forth in convincing manner the great need for clearance of our slums and for the re-housing of the low income groups. It discusses the present housing conditions in various large cities, citing the surveys conducted by local and federal agencies, and summarizes the data obtained. There is also a discussion of the difficulty of meeting the needs of the low-income groups, either through private enterprise for profit, or by means of limited-dividend housing companies. The success of a number of such undertakings in England is cited in support of the beneficial results of slum clearance and rehousing.

Homes Conference Proceedings

PROCEEDINGS of the Homes Conference held at Purdue University on June 1, 1935, have been published in book form as *Bulletin Number 6* of the *Purdue Research Foundation*, Lafayette, Indiana.

This 56-page book contains the addresses and papers that were presented as a part of the conference program. There is also an illustration of the Purdue all-weather laboratory (See page 18 of the July issue of CONCRETE), in which all kinds of weather conditions will be created for the study of the effects on type of construction.

The list of registrants shows that a number of notable housing authorities attended this conference.

Cement and Concrete Reference Book

CEMENT AND CONCRETE REFERENCE BOOK, 1935, published by the Portland Cement Association, 33 W. Grand Ave., Chicago, contains a number of facts and figures about these universally-used materials.

Various sections contain information on the manufacture of cement, on concrete construction, on aggregates suitable for concrete, on steel reinforcement, on manufactured concrete products, on cement stucco, coloring, and related subjects. Single copies may be obtained free from the publisher.

Proceedings of Highway Research Board

PROCEEDINGS OF THE FOURTEENTH ANNUAL MEETING OF THE HIGHWAY RESEARCH BOARD, edited by Roy W. Crum, published by the National Research Council, 2101 Constitution Ave., Washington, D. C. Paper binding, 481 pages, 7 by 10 in., illustrated.

This publication contains the papers presented at the annual meeting held in Washintgon on December 6 and 7, 1934, including reports and papers on the design of highways, materials and construction, traffic, and highway transportation economics.

Road School Proceedings

PROCEEDINGS of the Twenty-First Annual Road School, held at Purdue University in January, 1935, have been published by the Engineering Extension Department of Purdue University, Lafayette, Indiana.

This paper-bound volume of 117 pages contains 15 papers on a variety of subjects pertaining to highway development, construction, and maintenance. Notable among these is a paper on *What Is New in Concrete Paving Practice, by V. L. Glover*, engineer of materials, Illinois Division of Highways.

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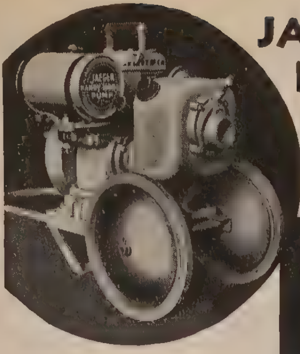

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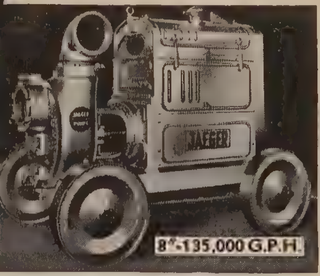

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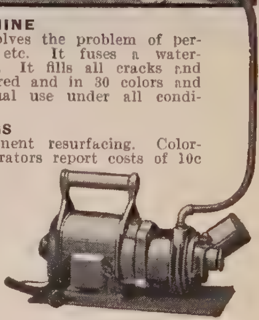

CHEMISTRY OF CEMENT and CONCRETE

BY
F. M. LEA—Building Research Station, England
AND
C. H. DESCH—National Physical Laboratory, England

This book is intended not only for the chemist, but also for the engineer and architect who deal with cement and concrete.

The following is taken from a review of this book by Dr. LOUIS A. DAHL, Research Chemist, Portland Cement Association

Besides the chapters pertaining to raw materials, phase relations, constitution and the clinkering process, there are chapters discussing the process of hydration, the setting and hardening of cement, action of acid and sulfate waters, pozzolanic cements, blast-furnace slag cements, aluminous cement, concrete aggregates, resistance of concrete to natural destructive agencies, resistance to organic and inorganic agents, and examination of failures.

In this work there is collected into one volume the most vital information on the subject that has appeared in recent years. The arrangement is logical, and the discussion easily read. A large number of references are given.

The book is to be highly recommended as a comprehensive and up-to-date treatise on the chemistry of cement and concrete.

429 PAGES—6 x 9—ILLUSTRATED

Price $9.50—Postpaid

Concrete Publishing Company
BOOK DEPARTMENT
400 West Madison Street Chicago, Illinois

BASIC PRINCIPLES *of* Concrete Making

By FRANKLIN R. McMILLAN
Director of Research, Portland Cement Association

THE author has culled the essentials out of a mass of scientific data on this subject and presents them with force and directness in this book. He shows the effects of quality of material, of proportioning, mixing, working and curing on the finished concrete.

The importance of variable mixes; tests for permeability; how to obtain strength, durability and watertightness; effective ratios; importance of proper construction methods—these and many other vital topics are discussed fully and authoritatively.

The book represents not only extensive accumulated knowledge, but also wide practical experience in the field and laboratory. It is an enlargement and revision of a series of notable articles on concrete mixing by Mr. McMillan published in 1929.

Ninety-nine pages, 6x9½, 32 illustrations and tables.

Price $2.00 Postpaid

CONCRETE PUBLISHING COMPANY
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EQUIPMENT AND MATERIALS

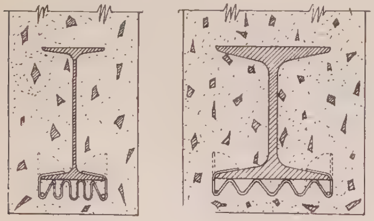
SMITH 7-S and 10-S mixers are now available in three types—the conventional four-wheel side discharge mixer, the new four-wheel end-discharge model, and the two-wheel "Trail-Smith."

New T. L. Smith 10-S 4-wheel end-discharge concrete mixer

A new bulletin is now being distributed by the T. L. Smith Company of Milwaukee, describing these machines in detail. All three types have the Smith "End-to-Center" mixing action, and all-steel big-diameter drum. A new vertical syphon-type water tank supplies water accurate-to-the-ounce, they say.

•

O-K BEAM WRAPPING is a new fabricated wire reinforcing for structural steel fireproofing concrete, being manufactured by Concrete Accessories Inc., Chicago, Ill.



O-K beam wrapping
Patented

It is made in three widths, 5 ft. lengths. One size may be spread to apply to different sizes of beams and yet the length remains the same.

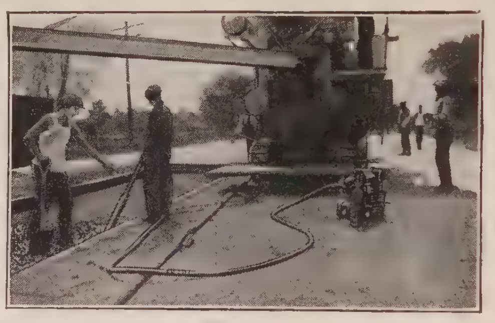
The unusual feature to this beam wrapping is that the individual clips may be stretched to fit different beam sizes without their spacing being altered. It is claimed that this is a distinct advantage to engineers.

The lateral wire, or clips, clamp around the beam and fasten to the flanges by the ends of the wires being bent over the edges of the flanges. These clips are spaced evenly by being welded to longitudinal wires. These wires are 5 ft. 1 in. long and the standard requirement is for the clips to be 12 in. apart; the material to be 12 gauge wire, galvanized after welding. It is also made of other wire sizes, and to meet the Government requirement that such reinforcing be made of 10 gauge wire and the clips be spaced 6 in. on centers.

Another advantage claimed is that the longitudinal wires are held in a definite position near the corners of the beam or column where reinforcing is desired, and that rods of any size desired may be used instead of these longitudinal spacing wires.

•

A 3-H.P. gas engine portable vibrator mounted on a pneumatic wheel, wheelbarrow type mounting, has been recently introduced by the Mall Tool Company, Chicago, Illinois. This vibrator was especially designed for use on pavement work for compacting concrete around ace joints and at the edges of the pavement. The wheelbarrow mounting provides unusual portability inasmuch as the entire assembly can be moved along the edges of the pavement as the work progresses.



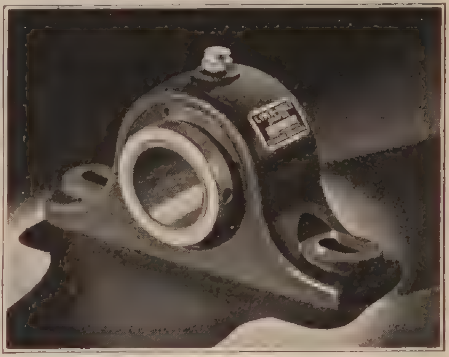
Mall portable vibrator designed for pavement work

The 3-h.p. gas engine power unit delivers vibration frequencies varying from 2,000 to 4,500 per minute, they say, which will comply with practically all specifications for concrete placement.

This Mall outfit can be furnished with 14, 21 and 28 ft. of shafting.

LINK-BELT Shafer self-aligning roller bearing "Series 400" is a new line of bearing units just announced by Link-Belt Company.

Shafer self-aligning double-row roller bearings are used in Link-Belt mountings, which are said to make an excellent combination for general service. These units are available for pillow blocks, flange bearings, hangers, and take-ups.



Link-Belt Shafer self-aligning roller bearing

The advantages of the new combination are pointed out as: 1. Ability to carry (a) radial loads, (b) thrust loads, (c) radial and thrust loads combined. 2. Inherent self-alignment.

Industrial Literature

HOW to Paint Portland Cement Stucco, Concrete Floors and other Masonry Surfaces is the title and subject of A.I.A. file 25c2 published by Medusa Products Company, Cleveland, Ohio.

Manufacturers' News

JOSEPH T. RYERSON & SON, Inc., recently completed a new addition to their Jersey City plant, making available an additional 45,000 square feet of floor space.

Ryerson Jersey City plant including additions

Vol. XLIII
No. 11

Cement Mill Section of
Concrete

November
1935

ANHYDRITE-SLAG CEMENT

Ten Per Cent Addition of Basic Slag Shows Highest Compressive Strength—Cement Has Some Degree of Hydraulic Property

By DR. PETER P. BUDNIKOFF
Professor, Institute of Chemical Technology, Charkoff, U. S. S. R.

ANHYDRITE cement is a product obtained through the fine grinding of natural gypsum dihydrate ($CaSO_4.2H_2O$), burned at 600 to 750 deg. C., or of unburned natural anhydrite ($CaSO_4$) together with appropriate additions. The following additions that activate the dead-burned modification of calcium sulfate have attained practical importance: Sodium bisulfate; dolomite burned at about 900 deg. C.; and lime, either in the form of calcium oxide or that of calcium hydroxide[1].

Basic Slag Meets Requirements

In looking for means to obtain a cheaper anhydrite cement, and at the same time to increase its stability in water, I have found that dry-granulated basic blast-furnace slag satisfies these requirements.

Our former investigations[2] demonstrated that basic blast-furnace slag can be used for the production of clinkerless slag cement by grinding it intimately with different modifications of calcium sulfate or with burned dolomite[3]. Practical importance has been attained by artificially-prepared or natural anhydrite mixed with dolomite burned at about 900 deg. C., or with dolomite dust (waste from the production of metallurgical dolomite)[4].

Important Property of Slag

In this case the total quantity of all additions usually does not exceed 10 per cent. When producing clinkerless cement, the glassy matter of the basic slag, as our investigations have demonstrated, obtains the faculty of hydrating under the influence of insoluble anhydrite[5]. In this connection the $CaSO_4$, in the process of interaction with the components of the slag, acquires also the faculty of hydrating, and subsequently recrystallizing.

This fact has been back of the use of basic blast-furnace slag as an activator of the dead-burned modification of calcium sulfate—insoluble anhydrite. My investigations in this direction have confirmed the above considerations.

Composition of Raw Materials

For the investigation, we used an anhydrite obtained by burning natural gypsum at about 600 deg. C. for a period of 1 hour. The product obtained was ground intimately with 5, 10 and 15 per cent of dry-granulated basic blast-furnace slag. The composition of the raw materials was as shown in Table 1.

The anhydrite-slag cement obtained was subjected to the compression test (by Kuhl), and the soundness was also investigated by means of the volume-change test. Anhydrite cement obtained by the simultaneous grinding of artificially-prepared anhydrite with 0.8 per cent of $NaHSO_4$ plus 0.6 per cent of $CuSO_4$ (copper sulfate) was taken for comparison. The results of the tests are given in Table 2.

Ten Per Cent of Slag

The data obtained demonstrate that the highest compressive strength of anhydrite-slag cement is attained when 10 per cent of slag has been added. The advantage of this anhydrite cement lies

(*Continued on page 38*)

TABLE 1—COMPOSITION OF RAW MATERIALS

	SiO_2	Al_2O_3 plus Fe_2O_3	CaO	MgO	SO_3	MnO	Loss on ignition
Blast-furnace slag	33.84	9.80	50.84	1.28	2.95	1.22	0.22
Gypsum	0.72	0.28	33.14	0.21	46.53	......	19.06

TABLE 2—RESULTS OF TESTS

Composition	Fineness of grind: Per cent retained on 900-mesh* screen	Fineness of grind: Per cent retained on 4,900-mesh* screen	Time of set: Beginning hr.	Time of set: Beginning min.	Time of set: Final hr.	Time of set: Final min.	Compressive strength of 1:3 mortar, in lb. per sq. in.: Stored in water 4 da.	Stored in water 7 da.	Stored in water 28 da.	Stored in water 2 mos.	Stored in air 4 da.	Stored in air 7 da.	Stored in air 28 da.	Stored in air 2 mos.	Combined storage 28 da.	Combined storage 2 mos.
(1) Anhydrite 95%, slag 5%	0.1	5.9	2	20	2	55	284	427	1,635	1,780	498	498	1,280	1,635	1,280	2,420
(2) Anhydrite 90%, slag 10%	0.1	6.1	2	5	2	25	142	427	2,060	2,350	1,422	1,493	1,780	4,055	2,490	3.200
(3) Anhydrite 85%, slag 15%	0.1	5.9	2	0	4	30	71	71	1,210	1,705	925	1.280	1,635	2,205	2,060	2,205
(4) Anhydrite cement, 100%	0.1	5.9	0	55	2	10	512	270	583	512	1,635	1,705	1,850	3,625	1,780	1,705

*The sieves designated as 900 and 4,900 meshes (per sq. cm.) are equivalent to 76 and 178 meshes per lin. in., respectively.

NOTE—The test for soundness (heating to 120 deg. C., boiling in water during 28 days) was passed satisfactorily by all the cements.

Calcium Sulfate Cement and Pure CO_2 Gas

Develop Process for Simultaneous Production of Both Products—Cement Similar to Keene's—Recover Carbon Dioxide Gas in Pure Form

IN the September issue of the *Cement Mill Edition* of CONCRETE an article on *Dry Ice—a Cement Kiln By-Product,* makes brief reference to the method commonly employed in the manufacture of solid carbon dioxide in cases where the carbon dioxide gas is recovered from some industrial process such as the burning of cement, lime, or coke.

Trouble with Impurities

Inasmuch as the carbon dioxide gas thus recovered contains a number of impurities, it is necessary, first, to put it through a purifying process in order that the CO_2 gas may be available in pure form. The finished commercial product must be free of all disagreeable tastes or odors, if it is to be employed as a refrigerant.

The flue or kiln gases thus recovered are, in ordinary cases, purified by bringing them into intimate contact (while under high pressure) with a solution of normal sodium carbonate (Na_2CO_3). During this process the carbon dioxide gas is absorbed by the sodium carbonate solution, as a result of which a solution of sodium bicarbonate ($NaHCO_3$) is formed. This bicarbonate solution is then pumped into distillers, in which it is boiled under pressure, the carbon dioxide being recovered in reasonably pure form through the process of evaporation and distillation. In this boiling process — under pressure — the temperature is sufficiently high to drive off the CO_2, thus reconverting the sodium bicarbonate into the normal sodium carbonate with which the cycle was started. The reconverted carbonate can be used over again. As mentioned in the article to which reference has been made, this process often is accompanied by troublesome difficulties with sulfur.

New Process Avoids Impurities

A somewhat different process has been developed by C. C. Loomis and A. D. MacDonald, and assigned by them to the New England Lime Co., of Pittsfield, Mass. The process is covered by U. S. Patent 1,905,598, granted in 1933.

The process developed by Loomis and MacDonald, instead of utilizing waste kiln or flue gases, is in fact an original process covering the simultaneous production of solid carbon dioxide (dry ice) and a slow-setting calcium sulfate cement of a type similar to Keene's cement.

Special Cement Produced

This process, therefore, involves the production of a special type of cement, purely aside from the production of portland cement, and is of interest only to those manufacturers of portland cement who may be considering the possibilities of side lines. The raw materials employed consist of finely crushed limestone and a solution of sulfuric acid—and most portland cement manufacturing plants have an abundance of the former.

In the process developed by Loomis and MacDonald, limestone is crushed to a fineness such that at least 90 per cent, by weight, will pass a screen having 10 meshes to the linear inch. This finely crushed limestone is then brought into intimate contact with a solution of sulfuric acid of 66 deg. Baumé.

This contact is brought about by separately feeding the crushed limestone and the sulfuric acid solution, from separate sources of supply, into a mixer in the proportions of 150 lb. of limestone to 116 lb. of the solution. The mixer employed may be the paddle conveyor type now generally used for hydrating quick-lime, known as the Kritzer lime hydrator, except that it must be equipped with a system of collecting pipes for collecting the carbon dioxide gas that is being liberated. Air must be excluded from the mixer.

The mixture of finely crushed limestone and sulfuric acid solution is continuously stirred, and at the same time it is conveyed away along an inclosed passageway. This stirring and movement are continued until the sulfuric acid has become completely neutralized through chemical reaction with the limestone, after which the solid reaction product (the calcium sulfate) is separated from the carbon dioxide gas. This end point of reaction may be determined by test, by collecting a 1-gm. sample of the mixture and shaking it up with about 10 cu. cm. of water in a test tube, and testing for the presence of uncombined sulfuric acid by any suitable indicator such as methyl red solution.

Temperature of Mixture

The temperature of the reacting mixture may be anywhere from 110 to 300 deg. C.; but the temperature preferred is 170 deg. C. The temperature of the mixture is raised to the desired degree by the heat produced by the chemical reaction itself (that is, by the reaction between the finely crushed limestone and the sulfuric acid solution). By regulating the loss of this heat, the desired temperature is maintained — and this temperature is high enough to drive off the excess moisture, so that the solid product (the calcium sulfate) may be separated from the CO_2 gas.

Solid Product Is Cement

The solid product (calcium sulfate) resulting from this procedure is in the form of lumps, substantially free from moisture, and consists mainly of that form of calcium sulfate which possesses slow-setting cementing properties. This solid product is continuously removed from the mixer as rapidly as it is formed. It is then cooled, and ground to the degree of fineness required for cement.

Recover Pure CO_2

During the chemical reaction between the ground limestone and the sulfuric acid solution, air is excluded from the mixer. Thus the CO_2 gas liberated by the reaction and collected by the system of collecting pipes is in its pure form, free of air or other foreign gases. In this pure form the carbon dioxide gas is then available for conversion into solidified carbon dioxide, or dry ice; or it may, of course, be compressed into liquid carbon dioxide and stored in cylinders suitable for shipment, and supplied in this form to other plants that manufacture dry ice, or utilized for a number of other purposes for which pure carbonic acid gas is useful.

CEMENT-MILL REPAIRS

• How Arc Welding Restores Equipment at Fraction of Replacement Cost—Also Saves Money on Erection and Alteration

By A. F. DAVIS

Vice-President, The Lincoln Electric Company, Cleveland, Ohio

THE value of the electric arc for cement mill machinery maintenance is unlimited. This modern repair tool can be used as handily for repairing a broken iron casting as for building a new steel workbench or resurfacing a piece of worn shafting.

Comparison of the cost of welded repairs with the cost of replacement will show in many instances enough savings to pay the cost of the welding machine in less than a month's time.

Methods Vary

Where mild-steel parts are being repaired a coated electrode is recommended in preference to bare or washed electrodes, because of the greater strength of shielded arc welds. Not only is tensile strength greater, but welding speed is increased from 100 to 300 per cent. Better welds, lower repair costs and less time lost while repairs are being made, all lead to great savings.

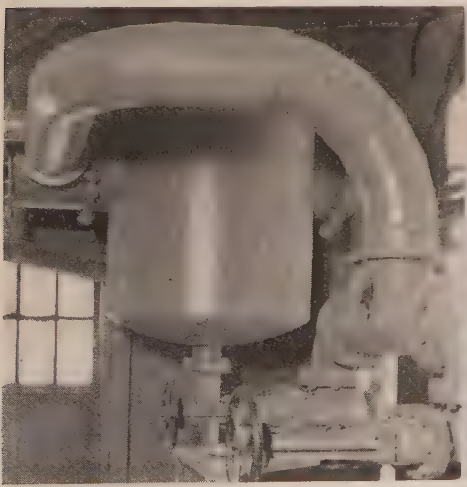


Fig. 1 (Left)—Cement plant piping systems erected, repaired, or altered, economically and without difficulty, by arc welding. Fig. 2 (Right)—Car wheels restored to condition of new wheels by applying long-wearing weld metal to worn surfaces and grinding to true size

Where new manganese steel wearing surfaces are built up by welding additional metal on to worn parts with a high-manganese steel electrode, the new surface is usually more resistant to abrasions and wear than the original part. The life of the part rebuilt by arc welding is often many times that of a new part. Welds produced by a high-manganese electrode have a flat bead with no surface checks. The weld metal has a high density and is extremely tough and hard. Resistance to wear is equal to that of heat-treated cast manganese steel.

Either mild or high-carbon steel may be hard surfaced with special electrodes. With a little practice any welder can build up worn parts to resist severe shock and abrasion. An electrode is available for providing wear-resistant weld metal for practically any service condition.

Examples of Cement Mill Repairs

As a typical example of the savings made by arc welding, take the principal parts of a cone crusher which have been worn beyond use. Several hundred dollars would be required to replace the bowl liner and mantle. And this figure does not include the extra expense of lost operating time. These parts are reclaimed by arc welding at a cost of only 25 per cent of the replacement cost by building them up quickly with the electric arc.

Other examples of the great savings made by arc welding in one plant include the rebuilding of the mantle and concaves of a gyratory crusher for one fourth the cost of new parts; rebuilding a dipper front for approximately one quarter of the original cost; reclaiming shovel traction links for $10 to $30—parts that cost new $50 to $125; rebuilding dipper teeth for less than a third of the cost of new ones; restoring a gear, which would cost $85 and take 7 hours to replace, for $10 in 2 hours.

In piping systems of cement plants, as in the power plant and pneumatic conveying systems, arc welding repairs broken joints and leaks; also makes new connections to existing lines. Where large leaks are present a section is cut out of the line and a new sleeve welded on. Pinhole leaks are repaired by welding a patch on the line. The thickness of the pipe to be repaired determines the size of electrode to use. For smaller sizes, 5/32-in. coated electrodes are used; for larger sizes, 3/16-in. The electric arc also erects new piping, as shown in Fig. 1.

Locomotive Repairs

Immediate repairs to quarry locomotives are frequently necessary. Shielded arc welding easily and effectively repairs frame breaks. A common locomotive repair job is the welding of flues. Welds are made from the top of the tube down each side, with a 5/32 or 3/16-in. coated electrode. To avoid localizing heat in one section of the flue sheet, adjacent flues should not be welded consecutively. Side sheets and flue sheets which have become rusted and weakened can be built up by depositing layers of weld metal on the thin plate until proper thickness is obtained. In case the sheet is thin over a large area, it is often advisable to weld on a patch instead of building up the plate. Welding is also extensively used for building up other worn locomotive parts and car wheels, as illustrated in Fig. 2.

Vibrating screen frames which break as a result of their severe duty can be made even more rugged than when new, by welding with mild-steel coated electrodes.

Manganese screens usually become thin in spots, due to the fact that certain parts are subjected to harder wear than others. This means that the entire screen would have to be replaced with a new one if it were not possible to reclaim it by arc welding. Original thickness and strength of screens can be restored readily with a high-manganese steel electrode.

Repairing Worn Shafts

Shafts wear rapidly at the stuffing boxes and bearings, due to the large quantities of fine dust present in the rock crushing plant of a cement mill. These worn shafts can be built up easily with arc welding and then turned down to proper size. Without arc welding, these shafts would have to be discarded for new ones. In order to keep the heat equalized on each side, it is best to run beads parallel to the axis of the shaft, rotating the shaft 180 degrees after each bead.

Broken truck frames can be easily welded with a heavily coated electrode.

Damaged, weakened or loosened crane booms can be renewed by welding on patches or replacing damaged members.

Caterpillar track sprockets, cast steel racks and pinions, can be reclaimed by building up worn teeth by depositing layers of heavily coated mild-steel electrodes until the tooth is shaped to normal size, and then hard-surfacing with high-carbon steel rod.

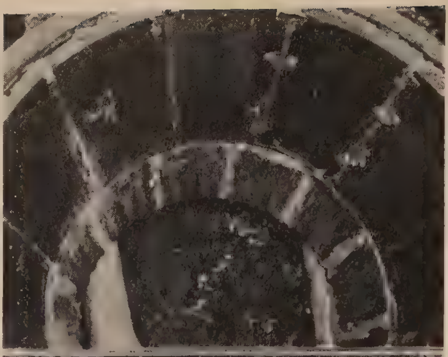
Erecting Chutes and Hoppers

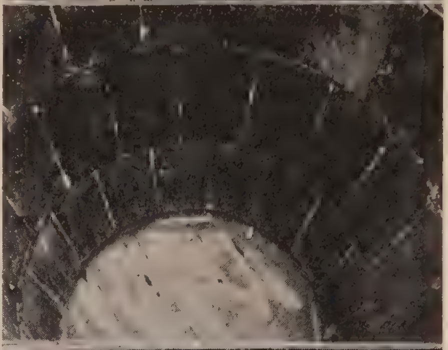
New chutes and hoppers can be easily constructed by simply cutting the usual ¼-in. plates to shape and welding them together. Building these pieces of equipment by arc welding saves 35 to 65 per cent as compared with having them made outside by riveting. The latter method also makes it necessary to lay out such jobs. Chute parts which are subject to abrasive action can also be hard-surfaced with a high-carbon steel or high-manganese steel electrode. This hard surfacing greatly increases their wearing qualities.

Shovel points can be built to size and hard-surfaced with the manganese-steel electrode.

Adding Sturdiness to Crushers

The cast iron spiders in crushers wear rapidly because they receive the impact of the material when it is dumped into the crusher. Spiders which have been worn until practically worthless have been built up successfully by welding on a pad of 18-8 stainless steel and then applying a layer of high-manganese steel electrode for a protective coating. Adding a layer of manganese steel when necessary keeps the spiders in good shape.





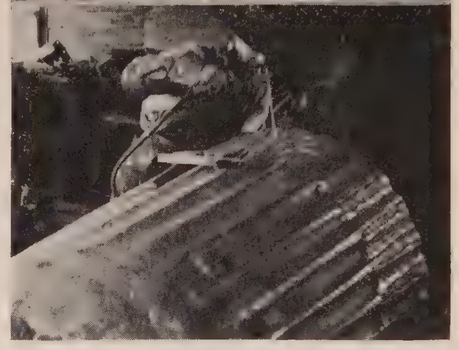


Fig. 3 (Top)—Concave liners of cement mill crusher, built up by arc welding, in good condition after year's service

Fig. 4 (Middle)—Arc welded ribs of crusher liners show little wear after year's use

Fig. 5 (Bottom)—Using electric arc and high-manganese steel electrode to build up head of cement plant crusher

The action of crushers has been made much more effective by building up ribs on the liners of concaves. The accompanying illustration (Fig. 3) shows the concave liners of a gyratory crusher after more than a year's use. The manganese concaves are built up by building ribs on flat surfaces with 3/16-in. and ¼-in. manganese steel electrodes.

Fig. 4 shows the built-up ribs on the liners of a crusher after a year's run.

Fig. 5 shows the head of a crusher being built up by arc welding with a high-manganese electrode.

Whatever the need, whether it be to repair equipment built of mild steel, stainless steel, high tensile steel, manganese steel or light gauge sheet metal, or whether the job is cast iron, galvanized iron or even aluminum, the plant maintenance department having an arc welding machine has only to choose the proper electrode and make speedy repairs.

Modern Welding Machines Needed

As indicated above, the cement plant can save thousands of dollars by using the electric arc in maintenance work. To obtain most savings, however, it is important that the welding machine have a uniform current, high capacity and utmost efficiency. The new arc welders are much more economical to use than those built only a few years ago. So great are the savings possible through use of modern arc welders that many plants have found they were money ahead by scrapping their obsolete quipment. The new welders actually save their cost in only a few months.

Another point about savings is the importance of using proper electrodes and accessories. The former will determine the quality of the work done, and the latter the degree of ease with which the welding is accomplished.

Anhydrite-Slag Cement

(*Continued from page* 35)

in its ability to acquire hydraulic properties to a certain extent.

For the production of anhydrite-slag cement, anhydrite from natural deposits also can be used. Until now, these natural deposits have not been utilized industrially.

Conclusions

Results may be summarized in the following conclusions:

(1) Basic blast-furnace slag can be used to obtain low-cost anhydrite-slag cement.

(2) Anhydrite-slag cement differs from the usual anhydrite cement in the fact that it acquires hydraulic properties to a certain extent.

(3) Further investigations should be undertaken under plant conditions with other kinds of slag, and the cement obtained should be brought to the test in actual construction work.

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Three Hundred Years of American Fuel

● Early Development of Fuel Industry—Rapid Progress Accompanies Mechanical Revolution — Petroleum Industry Arrives

By A. C. FIELDNER
U. S. Bureau of Mines, Washington, D. C.

This highly informative paper originally was presented by the author at the tercentenary celebration held by the American Chemical Society as a part of its annual meeting held in New York last April. It drew out an unusual amount of interest and discussion. The paper was published in the September (1935) issue of the A.C.S. publication, "Industrial and Engineering Chemistry." Through the courtesy of the author and that of the editor of "Industrial and Engineering Chemistry, the "Cement Mill Edition" of "Concrete" is enabled to reprint the paper in full.

A period of more than 100 years is covered by the statistical data given —a feature that, in itself, would mark this paper as an unusual contribution to industrial literature.

Let it be admitted that this subject is not one that is related exclusively to cement manufacturing; but in common with all industrial leaders, cement manufacturers can not be indifferent to the present and the probable future trends in the fuel industry, as here set forth. It is with this idea in mind that Dr. Fieldner's paper is given to our readers.—Editor.

THE American colonists 300 years ago had no need for the rich deposits of coal, petroleum, and natural gas which nature lavished on the continent of North America. Dense forests which had to be cleared furnished them plenty of wood for cooking, heating, and the limited industries of the time. Probably the first industrial use of fuel in America was in the making of glass near Jamstown, Va., in 1608 or 1609 by Captain John Smith, who needed glass beads for trade with the Indians (*10*). In 1639 the first glassworks in New England was built at Salem, Mass., and the first charcoal blast furnace for the production of iron was erected at the instance of John Winthrop, Jr., at Lynn, Mass., in 1645.

Discovery of Mineral Fuels

The first discovery of coal in North America, on Cape Breton Island, Nova Scotia, was described in 1672 (*9*); and the earliest recorded within the present territory of the United States was made in 1673 by Louis Joliet and Father Marquette on the Illinois River between the present sites of Utica and Ottawa, Ill. (*19*). The first mine to be opened in the United States was the "Midlothian," near Richmond, Va., about 1730. By 1750 the mines in the Richmond basin started commercial operation, and by 1789 shipments were being made to Philadelphia, New York, and Boston, where coal imported from Scotland, England, and Nova Scotia had been used to some extent as early as 1738.

The first mine in the Pittsburgh district was opened in 1760; bituminous coal was discovered in western Maryland in 1804, and in central Pennsylvania in 1806.

Graphitic anthracite was discovered in Rhode Island in 1760, and true anthracite in the Wyoming Valley of Pennsylvania near Wilkes-Barre in 1762, and in the Schuylkill Valley in 1770. The Wyoming anthracite was first used by local blacksmiths in 1768.

The earliest mention of petroleum in America is the account of the Franciscan missionary, Joseph de la Roche d'Allion, whose letter describing the well-known oil spring near Cuba, N. Y., was published in 1632 (*20*).

Natural gas, mentioned as early as 1775, was first used as a fuel in Fredonia, N. Y., in 1821; it was transported through 0.75-in. lead pipe from four wells 70 ft. deep.

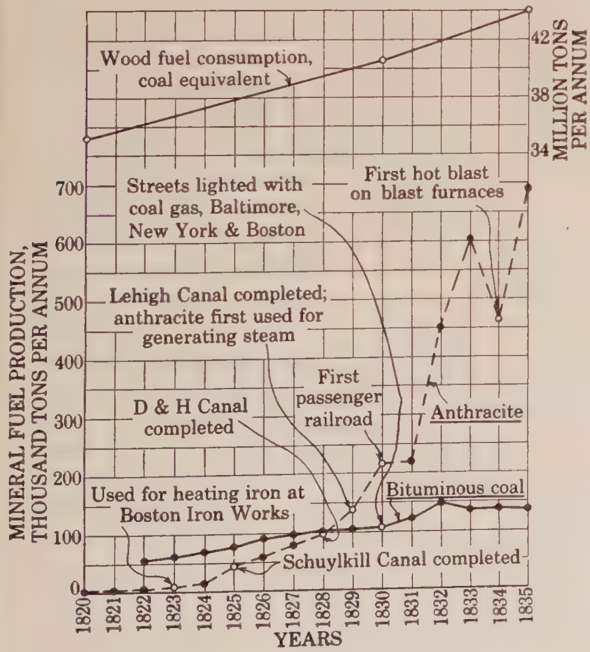

Fig. 1—Fuel production (net tons) from 1820 to 1835. Data on anthracite is taken from shipment records; wood and bituminous coal production figures are estimated

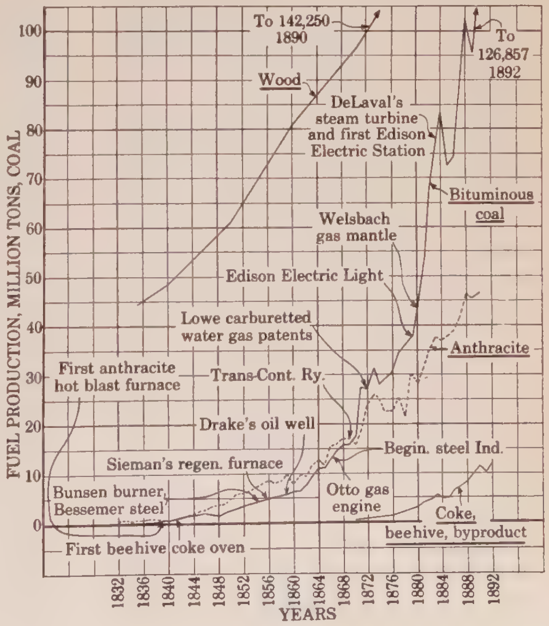

Fig. 2—Fuel production (net tons) from 1832 to 1892

Early Development of Fuel Industry: the Mechanical Revolution

The early development of the coal industry in the United States was accelerated by the great mechanical revolution which was beginning in Europe at the time our nation was born.

Fig. 1 shows the production of anthracite, bituminous coal, and firewood in the United States from 1820 to 1835. Most of the bituminous coal during this period came from Richmond; this basin also supplied the manufactured-gas industry, which started in Baltimore in 1816. However, Pittsburgh was beginning to show signs of its future industrial activity. It was using the locally mined bituminous coal for generating steam for its first steam engine in 1794, in the early manufacture of salt and glass, and in the working of iron. By 1825 about 3,500 tons of bituminous coal were used annually in the vicinity of Pittsburgh.

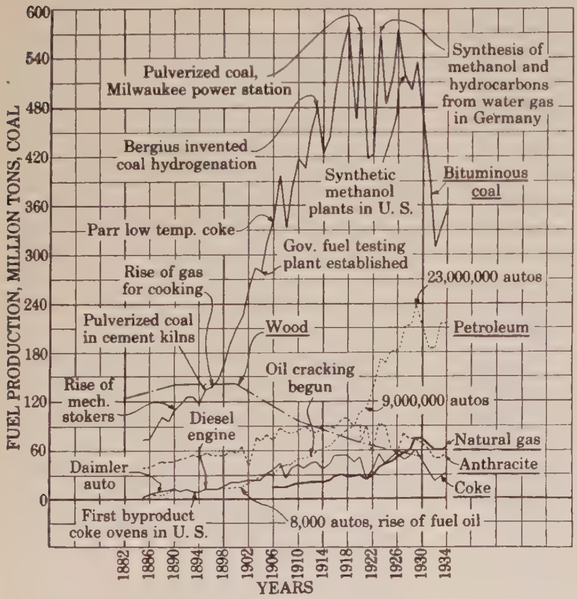

Fig. 3 — Fuel production (net tons) from 1882 to 1934. One ton of coal is regarded as equivalent to 1.25 cords of wood, or 4.2 bbl. of oil, or 26,000 cu. ft. of gas

The introduction of anthracite was slow because of the lack of knowledge of proper methods of burning it, and hazardous river transportation. It was not until 1808 that Judge Jesse Fells gave public demonstrations of burning anthracite in the grate of his hotel in Wilkes-Barre. Anthracite was first used for iron working in 1812 and for steam generation in 1825. In 1820 the Lehigh Coal Company, the oldest of the present companies, delivered and sold 365 tons of anthracite in Philadelphia. The opening of the Schuylkill Canal in 1825, followed by others leading to Philadelphia and New York, combined with the knowledge of how to burn anthracite in properly designed equipment, caused consumption to rise rapidly in the period beginning with 1828. In 1830 the first American-built locomotive used anthracite for fuel; and in 1835 anthracite was burned with the help of forced draft on the steamer *Portland*, built by Fulton in 1816. In 1839 the application of hot blast at Mauch Chunk and Pottsville blast furnaces started an important industrial use for anthracite that persisted for more than half a century. Fig. 1 shows that in 1835 wood was still the dominant American fuel, but the use of anthracite was increasing rapidly in comparison with that of bituminous coal. Petroleum and natural gas were known, but were of no signifiicance as fuels.

Last 100 Years of American Fuels

The real developments in American fuels have taken place in the last 100 years; the basic inventions were made in the first half of the period, as shown in Fig. 2, and the resulting industrial and social changes have become increasingly evident in the last 50 years (Fig. 3). The consumption of wood continued to increase during most of the first half of the century and was not overtaken by bituminous coal until 1896. The census of 1880 indicates that 65 per cent of the population depended on wood for fuel; the Forest Service estimates that, in 1930, 15 per cent used wood as their main fuel.

The development of steam transportation by water and rail (the outstanding feature of the first half of the nineteenth century) produced in 1840 the first acceleration in the curves of coal production, as shown in Fig. 2. The second acceleration in bituminous coal production (1861) coincided with the outbreak of the Civil War and was helped along by the growth of the steel industry resulting from the epoch-making inventions of the Bessemer process and the Siemens regenerative furnace in 1856. The third acceleration, in 1879, resulted from the settlement of the West and the heavy industries set in motion by the railroad and town-building program.

Coal and the Iron Industry

The iron and steel industry as we know it today could not have reached its present size without an abundant supply of cheap coal and coke.

The first two beehive coke ovens in the Connellsville district were completed in 1841 and shipped their product down the river to Cincinnati foundries. The number of coking establishments, mostly in Pennsylvania, grew from 4 in 1850 to 186 in 1880.

In 1860 the Baltimore and Ohio railroad was completed from Connellsville to Pittsburgh, and Connellsville coke was used in the Clinton furnace at Pittsburgh. Its use increased because of the rising price of charcoal and the diminishing availability of anthracite.

Beginning about 1845, free-burning splint and block bituminous coals were used directly in a few western Pennsylvania and Ohio furnaces. In 1880 the amounts of pig iron produced by the different fuels in the United States were reported as charcoal, 500,000 tons; anthracite, 1,800,000 tons; and coke and bituminous coal, 2,000,000 tons.

Coal Carbonization

The gas made by the public utilities for the first fifty years, beginning with the pioneer plant in Baltimore, was used principally for lighting. It was manufactured from bituminous coal in horizontal retorts. With the drilling of Drake's oil well in 1859 and the use of the kerosene lamp, coal gas became the inferior and more expensive illuminant (*14*). Fortunately the introduction of carbureted water gas, for which the first plant was erected in Phoenixville, Pa., by T. S. C. Lowe in 1873, provided cheaper and more flexible equipment which utilized the newly available petroleum in producing rich gas of higher illuminating value than was obtainable by the distillation of coal.

The industry grew and seemed firmly entrenched in the field of artificial lighting, when in 1879 Edison invented the first practicable electric lamp. The next year, in Austria, Auer von Welsbach

(2) promptly matched and even exceeded the brilliance of the early incandescent electric light by using a mantle of rare earth oxides heated to incandescence with a non-luminous gas flame. The blue-flame burner which Welsbach used was invented by another chemist, Robert Wilhelm von Bunsen of Heidelburg, Germany, in 1855.

The Infant Petroleum Industry

America's first oil well, completed by E. L. Drake near Titusville, Pa., in 1859, produced 15 barrels of petroleum per day from a depth of 66 ft. Other wells followed and drilling spread to other districts in Pennsylvania, West Virginia, and Ohio, wherever oil seepage or oil in salt brines had been noticed. The estimated annual production of petroleum increased from 2,000 barrels in 1859 to 4,000,000 in 1869, 20,000,000 in 1879, and 35,000,000 in 1889.

Kerosene from petroleum soon became the dominant illuminant for the home. Gasoline was worthless and a dangerous contaminant of both kerosene and the heavier fractions which found an outlet as fuel oil.

Otto invented the gas engine in 1867. Daimler modified it for gasoline in 1885, and built the first successful motor car in 1887, ushering in the third phase of the mechanical revolution. The first phase was initiated by Watt's steam engine in 1769, and the second by the practical application of electrical science to lighting and the transmission of power by Edison in 1879; the latter, in turn, was founded on Faraday's discovery of the principles of the electric motor in 1821 and of the dynamo in 1831.

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(The next installment, completing this paper, will discuss the rise and the accomplishments of research activities, and the probabilities in the fuels of the future.—Editor.)

Cement Companies of India Propose Merger

By C. GRANT ISAACS
U. S. Trade Commissioner, Calcutta, India

A SINGLE large corporation is being formed in Bombay which will buy up all existing cement companies in British India, according to press reports.

The idea underlying the proposed combination appears to be the effecting of a considerable saving in overhead expenses, including freight, and the procurement of machinery and other supplies. Some reports indicate the merger would result in a large saving to the industry.

According to the scheme, each existing company would transfer its works to the new company at the price of Rs. 60 per ton of output on the basis of the figures embodied in the agreement with the Cement Marketing Company, the present selling and distributing organization for cements manufactured by 8 large companies located throughout India. In addition, each member company would contribute Rs. 10 per ton of production capacity on the basis of the capital shares to the working capital of the new enterprise.

Aside from the advantages to be gained as mentioned above, the movement points in the direction of making India self-sufficient with respect to cement requirements. It is also maintained that Japan has been dumping cement in areas throughout India which are far removed from the present Indian plants. The new project is reputed to have under consideration the opening of new plants at these points.

On the other hand, the merger is not entirely free from its difficulties, for it is reported not to include the important Sone Valley Works, as well as another important company (Shahabads), which has not as yet sounded its reaction to the scheme. The latter is a unit of the Cement Marketing Company, but is regarded as holding an individual position with reference to general policies. Without these two companies it is believed doubtful that the merger could be realized.

Production and consumption of cement during 1934 increased considerably over that of 1933, and the outlook for 1935 is very promising. Total consumption of cement in India during 1934 amounted to 845,000 tons (5,034,000 barrels), of which 92 per cent was of domestic manufacture. — Foreign Trade Notes, U. S. Bureau of Foreign and Domestic Commerce.

Company-Dominated Unions Not Favored

THE new chairman of the National Labor Relations Board, Jos. W. Madden, has stated officially that company-dominated unions would be definitely frowned upon in rulings under the Wagner-Connery Act. He also advised that when a majority of workers in a plant or other unit of an industry decides in favor of a particular set of representatives to serve in dealings with employers, those representatives could bargain for *all* workers. The signifiiance of this policy will be quickly appreciated.—National Sand and Gravel Bulletin.

◆ EDITORIAL ◆

The P. C. A. Meeting

The annual meeting of the Portland Cement Association, scheduled to convene at the Blackstone Hotel in Chicago on December 9, will be held under circumstances differing essentially from those of a year ago.

Admittedly, the hopes of a year ago have not been realized. Shipments in 1935, instead of reaching the expected level of 100 million barrels, will do well to equal the 1934 total of 76 million. By the end of September, 1935 shipments were still trailing 1934 by three million barrels; but there was a gain in the month of September, and the remaining months of 1935 may show similar improvement.

Despite the disappointing volume of shipments in 1935, the general situation is entirely different from that of a year ago. At that time the hope for substantial improvement in cement shipments was based largely on the announced construction program of the Federal government. The long months of congressional bickering and the apparent impossibility of getting quick action on governmental construction are stories that need not be repeated.

Now we see the present situation far more promising. Private construction contracts have been climbing for many months—not alone in residential construction, but in other branches of the private building field.

In a word, the hope for substantial gains in construction volume in 1936 is based not on public works, but on private construction—the kind that really counts most in the end.

Summaries of recent reports from the F. W. Dodge organization, and from Brookmire, appearing in this issue of CONCRETE, show that the expectation of improvement in private construction is well founded.

The Chemical Exposition

The fifteenth Exposition of Chemical Industries, to be held at Grand Central Palace, in New York City, during the week of December 2 to 7, will constitute a display of America's chemical preparedness that all cement chemists and other cement operating officials should attend and study.

The establishment of a self-contained chemical industry in the United States is the only thing of substantial value which America got out of the World War. Its establishment meant more to the American people than reparations or territory. The chemical industries in this country are the groundwork of scores of other industries, cement manufacturing included. Accordingly, the exposition this year will be a mecca, not only for chemists, engineers, and executives in these fields, but for every person of responsibility in American industry during the recovery period.

In the field of dust-collecting equipment alone, one exhibitor will present the result of thirty years' experience in manufacturing, testing and servicing all types of dust collectors. Plant safety will be represented by comprehensive exhibits showing oxygen-breathing apparatus, all types of gas masks, dust respirators, paint respirators, protective hats, clothing and goggles. Acid-proof cements, brick and tile, as well as paint, will be exhibited, and there will be numerous examples of the recent developments in the field of acid-proof masonry construction.

Many large manufacturing companies are making arrangements to have their entire technical staffs attend this exposition. This shows a broadness of vision that might well be emulated by cement companies.

Consolidate the Industry

The Federal Trade Commission, under the provisions of the National Industrial Recovery Act as extended by the last Congress, was given authority to approve voluntary agreements for industrial co-operation designed to take the place of the codes invalidated by the Supreme Court.

Such voluntary agreements may include provisions dealing with the prohibition of unfair competitive trade practices, and provisions putting into effect the requirements of Section 7 (a) of the original National Industrial Recovery Act with respect to minimum wages, maximum hours, and prohibition of child labor.

Agreements of this character, when approved by the Federal Trade Commission, are expressly exempted from criminal prosecutions, injunctions, treble damages, and other penalties of the anti-trust laws.

An editorial on this page in the issue of July, 1935, and an article in the same issue, headed *Regional Cement Marketing Companies*, describe in some detail how the co-operative plan developed by the Appalachian Coals group might be applied to the cement manufacturing industry.

In a word, several courses are open to the cement industry through which its position may be strengthened against dangers similar to those arising from past lack of co-operation.

The best time to consolidate the industry is when internal dissension is at a minimum—as at present. If nothing is done until the next price war breaks out, the situation will quickly become so chaotic that constructive action will be next to impossible.

Studies of Iron Cements

Japanese Investigators Report Further Data on High-Iron-Oxide Portland Cements, Before Institute of Silicate Industry

IN continuation of their studies on the preparation and the hydraulic properties of so-called ore cement (Erzzement) or iron cement (Eisenzement), a type of high-iron-oxide special portland cement, Shoichiro Nagai and Keima Matsuoka give the following information in a paper presented to the Institute of Silicate Industry, Tokyo Imperial University.

One of the high-iron-oxide special portland cements known as "Kalicrete," proposed by Thorvaldson and Flemming, contains alumina and iron oxide in nearly equal quantities of 4 to 4.5 per cent—i.e., about 13 per cent of celite ($4CaO.Al_2O_3.Fe_2O_3$) and about 3.5 per cent of tricalcium aluminate ($3CaO.Al_2O_3$). The alumina content is thus a little larger than the equimolecular proportion to iron oxide for the formation of celite. The authors, by increasing the content of iron oxide, made two raw mixtures of modified type of "Kalicrete" cement from raw materials of limestone, clay, ganister, and copper slag, as shown in Table 1.

By using these two mixtures several series of comparative tests were carried out to study the degree of combination between lime and silica, alumina, iron oxide, etc., by determining the amounts of residual free lime and insoluble residue of acid components. The heating temperatures were 1,300 to 1,350 deg. C., and the heating time one hour. The results are shown in Table 2.

As seen from these results, for the formation of "Kalicrete" cement, heating at 1,350 deg. C. was sufficient.

By using the preliminary studies these high-iron-oxide special portland cements—i.e., two iron cements and one "Kalicrete" cement—were prepared from raw materials of limestone, clay, ganister and copper slag. The raw mixtures were molded with water into spheres of 15 mm. diameter, dried in air, and burned to clinker at 1,350 to 1,360 deg. C. in a gas furnace. The three clinkers were ground to cement with 2.5 per cent gypsum, and had the physical properties, chemical compositions, and hydraulic compounds, calculated by the formula (*a*) proposed by the authors, and formula (*b*) proposed by R. H. Bogue, as shown in Table 3.

TABLE 1

	(VI a) Raw mixture Per cent	(VI b) Raw mixture Per cent
Loss on ignition	33.19	32.61
SiO_2	14.91	15.58
Al_2O_3	2.74	2.84
Fe_2O_3	4.16	4.35
CaO	43.74	43.21
MgO	1.02	1.06
Total	99.76	99.65

TABLE 2

No. of experiment	Raw mixture	Heating temperature (deg. C.)	Heated product Free lime Per cent	Heated product Insoluble residue Per cent
(41)	VI a	1,300	4.02	0.16
(42)	VI a	1,350	......	0.08
(43)	VI b	1,300	2.16	0.12
(44)	VI b	1,350	—	0.06

As seen from these results, iron cement (V) contains a little more $2CaO.SiO_2$ and less $3CaO.SiO_2$, owing to the presence of 5.3 per cent of magnesia and 60.9 per cent of CaO.

The three samples were tested for their hydraulic properties by comparing their tensile and compressive strengths and expansion or contraction. The results were compared with those of three commercial cements—i.e., one ordinary portland cement, one blast-furnace slag cement, and one mixed portland cement of "Neo-soliditit" type. The results of the strength tests are shown in Table 4, and those of expansion or contraction in Table 5.

It is seen that iron cements are slow-hardening cements, while "Kalicrete" cement hardens a little earlier. No. 246 ordinary portland cement was extremely slow-hardening, which is rare in Japanese cements, owing to its chemical compositions and hydraulic compounds (SiO_2, 22.08 per cent; Al_2O_3, 6.13 per cent; Fe_2O_3, 2.76 per cent; total CaO, 63.40 per cent; MgO, 2.38 per cent; free CaO, 2.72 per cent; combined CaO, 60.7 per cent; $3CaO.SiO_2$, only 22.8 per

TABLE 3

			Iron cement (II Bb)		Iron cement (V)		"Kalicrete" cement (VI a)	
Fineness	4,900	per cent	1.4		1.2		1.1	
	Loss on ignition	"	0.18		0.19		0.20	
	Insoluble residue	"	0.03		0.03		0.02	
	SiO_2	"	21.92		21.90		21.62	
	Al_2O_3	"	2.72		2.66		3.95	
	Fe_2O_3	"	7.42		7.37		6.10	
	CaO	"	65.08		60.86		64.80	
	MgO	"	1.08		5.31		1.46	
	SO_3	"	1.26		1.28		1.24	
	Total	"	99.69		99.59		99.41	
			(a)	(b)	(a)	(b)	(a)	(b)
Hydraulic compounds	$2CaO.Fe_2O_3$	"	12.6	5.4	12.6	5.5	10.4	.
	$4CaO.Al_2O_3.Fe_2O_3$	"	—	13.0	—	12.7	—	18.7
	$3CaO.Al_2O_3$	"	7.2	—	7.0	—	10.5	—
	$2CaO.SiO_2$	"	21.5	16.7	33.7	29.2	22.9	16.1
	$3CaO.SiO_2$	"	54.9	61.3	38.7	44.6	51.8	60.8

TABLE 4

No. of cement	Type of cement	Water-cement ratio (%)	Bending strength (kg. per sq. cm.) 3 days	7 days	28 days	Comb. 28 days	Total (B×10)	Compressive strength (kg. per sq. cm.) 3 days	7 days	28 days	Comb. 28 days	Total	Valuation number (Cw+10B)
(II Bb)	Iron cement	57	36.9	56.2	81.6	83.8	2,585	118	236	542	397	1,293	3,878
(V)	Iron cement	57	31.8	44.3	74.6	74.6	2,253	85	160	293	309	847	3,100
(VI a)	"Kalicrete"	57	41.3	60.6	83.6	85.8	2,713	148	272	466	474	1,360	4,073
No. 246	Portland cement	60	36.2	48.1	69.2	75.2	2,287	120	193	353	364	1,030	3,317
No. 238	Blastfurnace slag cement	58	52.4	71.3	83.2	99.8	3,067	207	365	530	528	1,630	4,697
No. 242	"Neo-soliditit"	63	37.9	43.0	73.4	68.9	2,232	133	189	368	349	1,039	3,271

From September (1935) issue of Cement and Cement Manufacture.

TABLE 5

No. of cement	Type of cement	Water-cement ratio per cent	Expansion (+) or contraction (—), (mm/10 m)				
			3 days	7 days	28 days	Comb. 28 days	Boiled 3 hrs. after 28 days
(II Bb)	Iron cement	57	+1	+1	+1	—3	0
(V)	Iron cement	57	+1	+2	+2	—3	+1
(VI a)	"Kalicrete"	57	+1	+1	+1	—3	0
No. 246	Portland cement	60	+2	+3	+3	—3	+2
No. 238	Blastfurnace slag cement	58	+1	+2	+2	—4	+2
No. 242	"Neo-soliditit"	63	+1	+2	+2	—4	+1

cent; $2CaO.SiO_2$, 46.1 per cent of low-heat or low-temperature cement type).

It is seen that iron cement and "Kalicrete" cement are as stable as other types. No. 246 portland cement is a little unstable owing to the large amount of uncombined or free lime (2.72 per cent), No. 242 "Neo-soliditit" cement is a little expansive, owing to the large amount of admixture of siliceous nature (30 to 40 per cent), and (V) iron cement expanded a little owing to the large amount of uncombined or free magnesia (5.3 per cent).

These six cement samples of various types were tested for temperature rise on setting and hardening by the method of measuring temperature rise of cement paste in a small Dewar glass vessel. Iron cements (IIBb) and (V) are seen to generate the least heat, and are suitable for mass concrete.

The authors are continuing the comparison of these high-iron-oxide special portland cements with several mixed portland cements, by studying their resistance to various salt solutions of NaCl, $MgCl_2$, Na_2SO_4, $MgSO_4$, etc.

High-Strength Alumina Cement by New Process

By GEORGE C. HOWARD
U. S. Trade Commissioner, Calcutta, India

NOTICES have appeared in engineering papers recently concerning the invention by Roy Chowdhury of a process for the economic manufacture of bauxite cement which effects a saving in the capital cost of the plant as well as in the cost of manufacture of the alumina cement.

The invention is based on the discovery that intimate chemical combination of lime with alumina of bauxite takes place, if the mixture of lime and raw bauxite, after fine grinding, is subject to pressure of not less than 8,000 lb. per sq. in. and calcined in ordinary vertical kilns. The baked mass is monocalcium aluminate cement. For instance, 40 parts of unslaked lime containing at least 80 per cent calcium oxide are mixed most intimately with 60 parts of raw bauxite containing at least 45 per cent alumina and pulverized to a fineness of 150 meshes per square inch. A small quantity of silica is usually present in the raw materials, and may be used along with them, provided it does not exceed 5 per cent of total mixture. A high per cent tends to reduce the tensile strength of the cement. The mixture is shaped or moulded into bricks or tiles in a press, which delivers a minimum pressure of not less than 8,000 lb. per sq. in. The pressed blocks or tiles are charged into ordinary shaft or lime kilns with layers of coal, and heated to a temperature of at least 1,050 deg. C. for a period not exceeding 12 hours. The burnt bricks or tiles are drawn from the bottom of the kiln, air-cooled and then broken into lumps. These lumps are subsequently pulverized to a fineness of 200-mesh. The novelty of the process is that the lime-bauxite raw mixture has to be ground to extreme fineness and pressed into blocks, bricks or tiles in a press delivering a pressure of from 8,000 to 10,000 lb. per sq. in. Hydraulic lime may be substiuted for unslaked lime in the manufacture of the cement.

The abundance of bauxite and limestone in Bihar and the Central Provinces, proximity to the coalfields, and the availability of labor skilled in handling ordinary lime kilns and crushing, has convinced the inventor that this new high alumina cement, which he believes is superior to portland cement in strength and other properties, will soon engage the attention of industrialists in India and will be made available at a price comparable with the Indian portland.—Foreign Trade Notes, U. S. Bureau of Foreign and Domestic Commerce.

Cement Imports Gain

APPARENTLY encouraged by the reduction in duty from 6c to 4.5 per 100 pounds accorded under the reciprocal treaty with Belgium, effective since May (1935) and by the increased demand resulting from the huge public construction programs in this country, foreign producers of cement have so increased the volume of shipments that in July of this year, the last period for which the Department of Commerce figures are available, they amounted to 22,029,985 pounds. In the first seven months of this year 92,139,470 pounds were entered, compared to 98,453,486 in all of 1934.

Confronted with the loss of markets along the seaboard as a result of the rapidly mounting competition from the cheaper imported product, domestic cement companies have reduced prices at tidewater until they are at the lowest point in years.

Department of Commerce figures indicate that practically all of the imported cement is of the kind known as hydraulic or portland. The setup of statistics does not show the various countries of origin, but shipments arriving here in recent months have been almost entirely from Belgium and Denmark. While the cut in duty applies specifically to Belgian cement, the benefits are extended to all countries.

In addition to a more favorable tariff rate, the cement importers have been free for almost a year from investigation of suspected dumping complaints. For a considerable period prior to last October cement from Belgium, Denmark, England, Cuba and Japan was on the list and appraisement of shipments was suspended, but on that date the Treasury Department ordered releases after inquiries had failed to produce evidence to justify a finding.

MILL EQUIPMENT

New Clinker Cooler and Burner Recover Waste Heat

Large Fuel Saving, Higher Quality of Cement, Reduced Power Consumption, Among Advantages Claimed

NEW equipment developed by the Traylor Engineering & Mfg. Co., Allentown, Pa., includes the Traylor-Cheesman Rotary Clinker Cooler and the Traylor-Cheesman Burner, for which high efficiency in cooling and great savings of kiln fuel are claimed.

The Traylor-Cheesman cooler (See Fig. 1) is a compact unit of the three-pass type, that assures cooling of clinker to within at least 100 deg. of atmosphere, with full recovery of the heat contained in the clinker. Air introduced into the cooler travels counterflow with the clinker and is in intimate contact with the heat transfer elements. Two basic elements of heat transfer are utilized, namely, high velocities of gases, and ample heat radiating surfaces, to make the cooler compact.

The cooler is completely enclosed within the shell, and is accessible. Due to the distribution of the loads, a minimum of power is required for driving, it is claimed.

In this combined cooler and burner installation only one fan is required, and very little attention is needed for controlling the air. When the burner is operated in connection with the cooler, all of the air required for cooling is used in the kiln for combustion, with no waste of either heat units or of power.

Operation of Cooler

The clinker is spouted into a brick-lined cylindrical chamber provided with lifters to shower the material, which then enters three of six flues formed in the annular space between the outer shell and a center tube, at the lower end of the cooler.

The clinker moves through these flues to the ends, at the discharge end of the cooler, where it is spouted into the center tube, which is provided with spiral lifters to cause the clinker to move toward the feed end. At the forward end of this tube the material is spouted into the other three, or "cold" flues, in which it again moves toward the discharge end. At the lower end of these flues the clinker is discharged into an annular trough built with lifter buckets which elevate it into a fixed discharge spout. The six flues are fitted with lifters and chains to hasten transfer of the clinker heat to the air.

The air moves through the cooler countercurrent to the clinker, in order to maintain a constant temperature differential, thereby assuring a uniformity in the physical condition of the clinker. Thus the air is gradually heated and attains its highest temperature when passing through the brick-lined receiving chamber, whence it is drawn into a cyclone and thence blown into the kiln burner. The brick-lined chamber is about half the length of the cooler; but due to the three-pass arrangement in the lower half of the shell the air travels about twice the length of the cooler. Also, the velocity of the air through the flues, where the temperatures are comparatively low, is very high, resulting in the most rapid and efficient heat exchange.

Interior Is Accessible

The interiors of all of the flues are accessible from the discharge end of the cooler, the

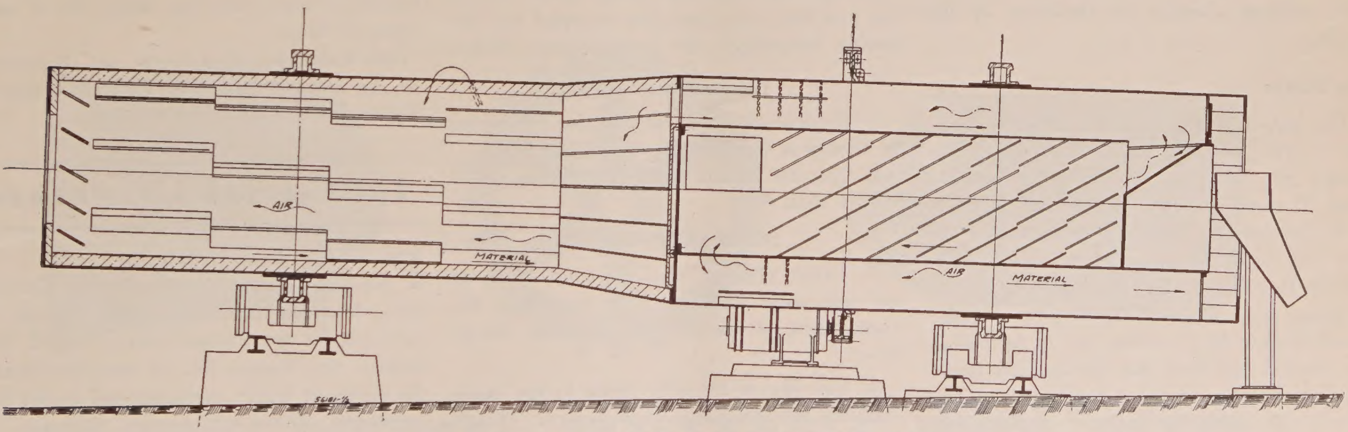


Fig. 1—The new Traylor-Cheesman rotary clinker cooler

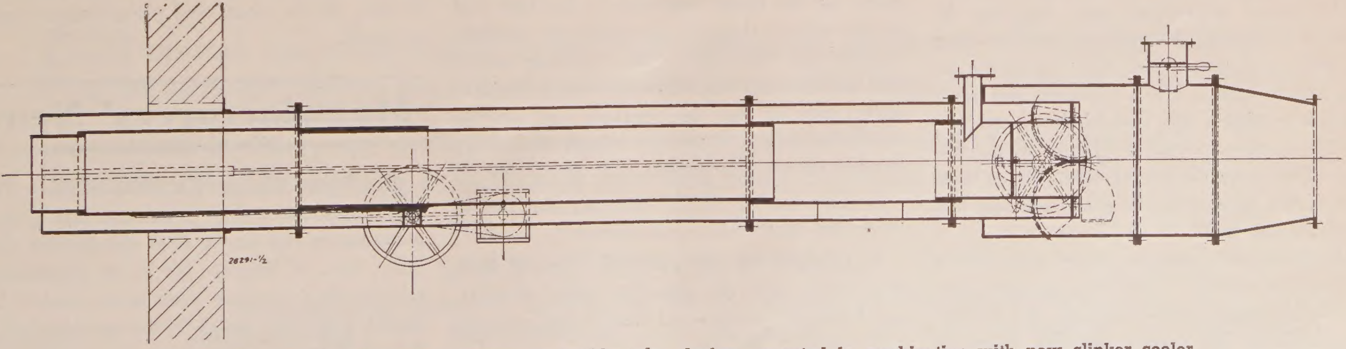


Fig. 2—New Traylor-Cheesman burner, of double tube design, operated in combination with new clinker cooler

MILL EQUIPMENT

three "cold" flues being open while the three "hot" flues are provided with manholes. A sectional head forms a partition between the brick-lined receiving chamber and the three "cold" flues and the center tube.

Ports and spouts are provided to direct the clinker into the center tube and other ports are located at the upper end of this tube to discharge the clinker into the three "cold" flues. Deflectors fitted into the upper ends of the "cold" flues direct the clinker to the discharge end of the cooler. The center tube, and the partitions that form the six cooling flues in the annular space surrounding the center tube, are of such design and assembled in such manner as to permit free expansion and contraction, due to changes in temperature, without damage or distortion of the cooler.

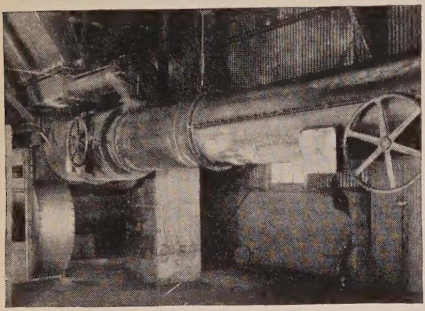


Fig. 3—Mill installation of new Traylor-Cheesman burner

The Burner

The burner is adaptable for pulverized coal, gas or fuel oil. In this device, all of the heated air from the clinker cooler supplies from 70 to 90 per cent of the total quantity of air required for complete combustion of the kiln fuel. This hot air is drawn from the connection between the kiln hood and the cooler. It passes into an adjustable cyclone where excess clinker dust is taken out. A fan draws the cleaned gas from the cyclone and blows it into the burner. Further, fuel may be introduced with either the primary or secondary air, depending on furnace conditions.

The burner is provided with adjusting devices in order that the primary and secondary air blasts may be varied. The tip of the inside burner tube is also adjustable, making it possible to obtain any desired flame and giving the operator complete control of combustion. The operator has at all times a clear view of the interior of the kiln, enabling him to adjust the flame to requirements.

The heated air from the cooler may have a temperature as high as 900 deg. or more, and all of this heat passes through the burner, thus attaining the highest possible economy. The flame is luminous, affording rapid transfer of the heat to the material being burned.

A Double Tube Design

The burner is of double tube design (See Fig. 2). The inside tube carries the primary air, while the annular space between the inner and outer tubes is for the secondary air. Each of these conduits is provided with a separate regulating valve, so that the quantity of air passing through each can be minutely controlled. The levers for these valves are fitted with quadrants to enable the operator to lock them in place.

The inner burner tube is fitted with a longitudinally adjustable sleeve at the flame end. This is adjusted from the outside by means of a lever, and the shape of the flame is regulated by changing the position of the sleeve. The fuel is introduced through the center tube.

The burner tube extends into the hood, the front of the hood being provided with an opening to receive it. The tube is so constructed that it may readily be removed and permit of the withdrawal of the fire hood to obtain access to the interior of the kiln without disturbing the regulating valves or the fan.

Fig. 3 shows a recent installation of this burner, operating with pulverized coal.

Installations made in cement plants within the past five years have demonstrated the following advantages, the manufacturer claims:

DIRECT ADVANTAGES

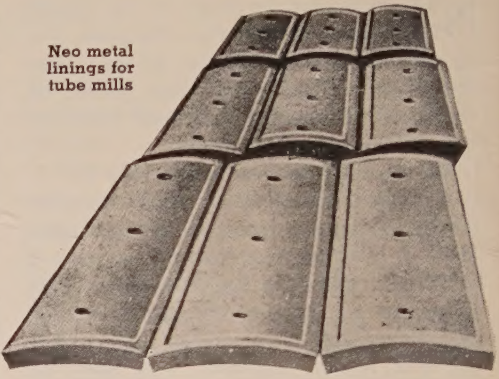
1. Reduction in fuel consumption per barrel of clinker of from 100,000 to 400,000 B.t.u.
2. Increase in kiln capacities of from 10 to 40 per cent.

INDIRECT ADVANTAGES

3. Easier grinding clinker; from 10 to 20 per cent more clinker will be ground to the same degree of fineness with the same energy input.
4. The life of the kiln lining in the burning zone will be markedly increased. This is due to the positive control by the kiln operator of the flame condition in his kiln and to the elimination of any harsh or extreme temperature conditions. The visibility within the kiln through the burning zone is remarkably clear, so that the operator can see the condition at all times. All cloudy and dusty conditions are eliminated.
5. The quality of the cement, both as to color and uniformity, is improved.
6. Clinker can be handled directly from the coolers into the grinding mills, eliminating handling charges and dust losses common with clinker storages.

NEO metal liner plates, made by Les Fondereis Magotteaux, Societe Anonyme, Vaux-les Liege, Belgium, are cast to specifications in foundries in Belgium and delivery to the U. S. A. is promised in approximately 30 days.

Neo manganese stel tube-mill liners are made by the company's own special process. A manganese content of 12 to 14 per cent is claimed. Brinnell hardness is said to be 550 inside the outer skin of the casting. They claim the tensile strength is excellent; liners are not brittle, not readily fractured. They are highly resistant to abrasion and thus reduce manufacturing costs by reducing tube-mill maintenance and non-productive time, by saving labor and re-lining costs. The manufacturer claims twice the useful life of other types of liners.



Neo metal linings for tube mills

Les Fonderies Magotteaux are represented in the United States by W. O. Hempstead, Philadelphia, Pa.

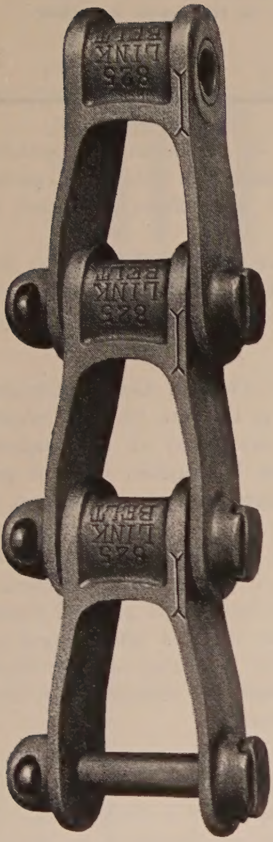
Industrial Literature

PENNSYLVANIA Steam Booster Compressors, described in Bulletin No. 163, are announced by the Pennsylvania Pump & Compressor Co., Easton, Pa., to meet the demand for steam at higher pressures and higher temperatures. These compressors, they say, can be furnished for drive by flat belt, multiple V-Belt, direct connected synchronous motor or steam.

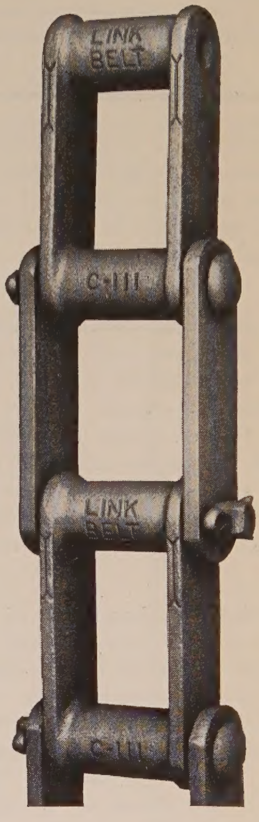
Manufacturers' News

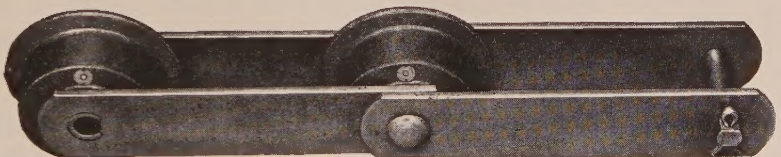
The Foster Wheeler Corporation (New York City) announces that it has recently granted a license to the *Green Fuel Economizer Company, Inc.*, of Beacon, N. Y., to manufacture an extended surface economizer under Bell patent 1,565,305, which is the property of the Foster Wheeler Corporation.

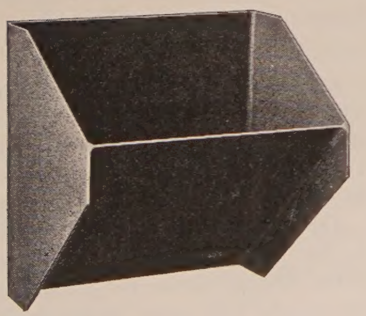
LINK-BELT

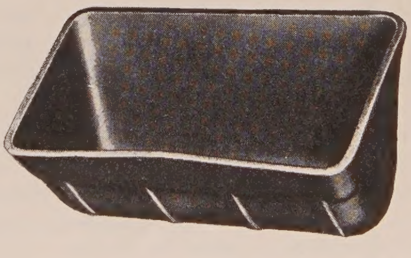


CHAINS SPROCKETS BUCKETS *for* MATERIALS HANDLING









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Men and Mills

News of and for Cement Mill Men

A clearing-house page for all kinds of news about cement men and cement mills. ℂ Readers in all mills, even though not regular contributors, are invited to send in news notes about personal and plant activities that may be of interest or value to the men in other mills.

Consolidated Cement Corporation, Chicago, reports for the quarter ended July 31, net income after depreciation and other charges of $41,536, equal to 41 cents a share on 100,617 Class A shares outstanding.

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International Cement Corporation will call for redemption on November 1 at 103¼ and interest $5,000,000 principal amount of the $18,000,000 original issue of twenty-year 5 per cent convertible gold debentures due in 1948, the company announced recently. Under the terms of the indenture covering the issue, the Chase National Bank, as trustee, will draw by lot the debentures to be redeemed.

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Despite the lower level of domestic business, improved earnings from South American operations enabled *International Cement Corporation* to report a 31 per cent gain in net earnings for the first half of the current year, compared with 1934. Per share earnings in the respective periods were 73 cents and 55 cents. The outlook for the rest of the year is for a moderate extension of the improvement. Some stimulus should be felt from the federal work-relief program, and orders from private and industrial outlets will probably increase slightly. Foreign business is expected to be well maintained. Indications are that 1935 earnings may approximate $1.25 a share.

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E. J. Mehren, president of the *Portland Cement Association*, talked to engineering students on October 7 in the Engineering auditorium at Madison, Wisconsin, on "Engineers I Have Known." Junior and senior engineering students were excused from their classes in professional subjects to attend the lecture.

Mr. Mehren addressed the fall booster meeting of the Technical club in Madison in the evening, discussing the engineer's license law.

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Ernest E. Berger, formerly chief chemist for the *Century Cement Manufacturing Company* of Rosendale, New York, has recently joined the Kosmos Portland Cement Co.

Mr. Berger brings to the Kosmos Company a rich background of training and experience that qualifies him exceptionally well for his work, which will involve research and the general supervision of quality control in the manufacture of the various Kosmos cements and Kosmortar.

A number of important technical papers have been published under Mr. Berger's name by the government, among them, notably: "Calcium Sulphate Retarders for Portland Cement," and "The Effect of Steam on the Decomposition of Limestone."

Since 1925 Mr. Berger has taken an active part in the work of the A. S. T. M. and since 1927 he has been a member of the American Chemical Society.

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The *Kosmos Portland Cement Co.*, Louisville, Kentucky, owns a Stinson cabin plane, one of fifty-four ships to enter the All-Indiana Air Tour held in June of this year. The tour is sponsored each year by the Indiana Aircraft Trades Association. During the five days of the tour, the group of planes criss-crossed the State of Indiana, stopping at various cities, to cover a distance of approximately 1,500 miles.

Hugh O'Daniel, who has served the Kosmos company for over 6 years, piloted the Kosmos plane and carried Harrison M. Bennett, Kosmos representative with headquarters in Indianapolis, as passenger. Mr. Bennett placed the Kosmos plane at the disposal of friends for brief hops at the various stops.

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Albert N. Horner, vice-president of the *Kosmos Portland Cement Company*, Louisville, Kentucky, together with his 13-year-old son Alexander, motored to Florida in September.

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Florida newspapers are carrying the story of the prospects of the establishment of a modern cement plant in Marion County by the *Lehigh Portland Cement Company* on the route of the trans-Florida ship canal.

The Lehigh company is said to own 1,919 acres of land in Marion County near Anthony, Burbank and Ft. McCoy, with extensive limestone and clay deposits and with actual construction of the cross state canal under way, the company is seriously considering the construction of a cement plant on its property north of Ocala. Joseph S. Young of Allentown, Pennsylvania, is president.

The Dixie Portland Cement Company is also said to have extensive holdings in Marion County of desirable cement, clay and limestone deposits and it is believed that this concern may also establish a plant.

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Riverside Cement Co., Los Angeles, Calif., declared the regular quarterly dividend of $1.50 a share on the outstanding preferred stock of the company on October 10, payable November 1 to stockholders of record October 15.

No action was taken with respect to dividends on the $1.25 cumulative Class A stock, on which dividends are now $4.49 in arrears.

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The *Standard Portland Cement Company*, with a factory at Fairport, Ohio, is celebrating the tenth anniversary of its foundation at the time that Willoughby, Ohio, is celebrating the centennial of the naming of the town.

This plant, in the ten years of its existence, has built up a large volume of business in the manufacture and sale of portland cement.

The plant has operated steadily and has provided work for a number of Lake county men. *A. H. Ingley* is secretary and treasurer of the concern.

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The state cement plant at Rapid City, South Dakota, has closed for a 30-day shutdown, according to an announcement by *William Fowden*, manager. Shipments during the shutdown will be made from the 100,000-barrel storage. Several employes are being kept at work in the packing and shipping departments.

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A late September issue of the Birmingham, Alabama, *News* carries a short item regarding the expectation of a reconstruction of the Leeds (Alabama) plant of the *Universal Atlas Cement Co.*, or its complete rebuilding.

The expectation, according to the *News*, is that the cement plant will be rebuilt entirely, thereby placing the plant in a position to compete with other modern mills.

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Frank J. Rief, purchasing agent for the Chicago district of the newly formed Carnegie-Illinois Steel Corporation, has also been appointed general purchasing agent for the *Universal Atlas Cement Company*, Chicago, to take effect November 1. He succeeds *W. H. Dutcher*, purchasing agent, who has been with the cement company for more than 30 years and who asked to be relieved of his duties.

Mr. Rief has been connected with the corporation for 23 years, beginning his work at the South Chicago plant of the Illinois Steel Company. In 1916 he was transferred to the purchasing department of the company in its Chicago office.